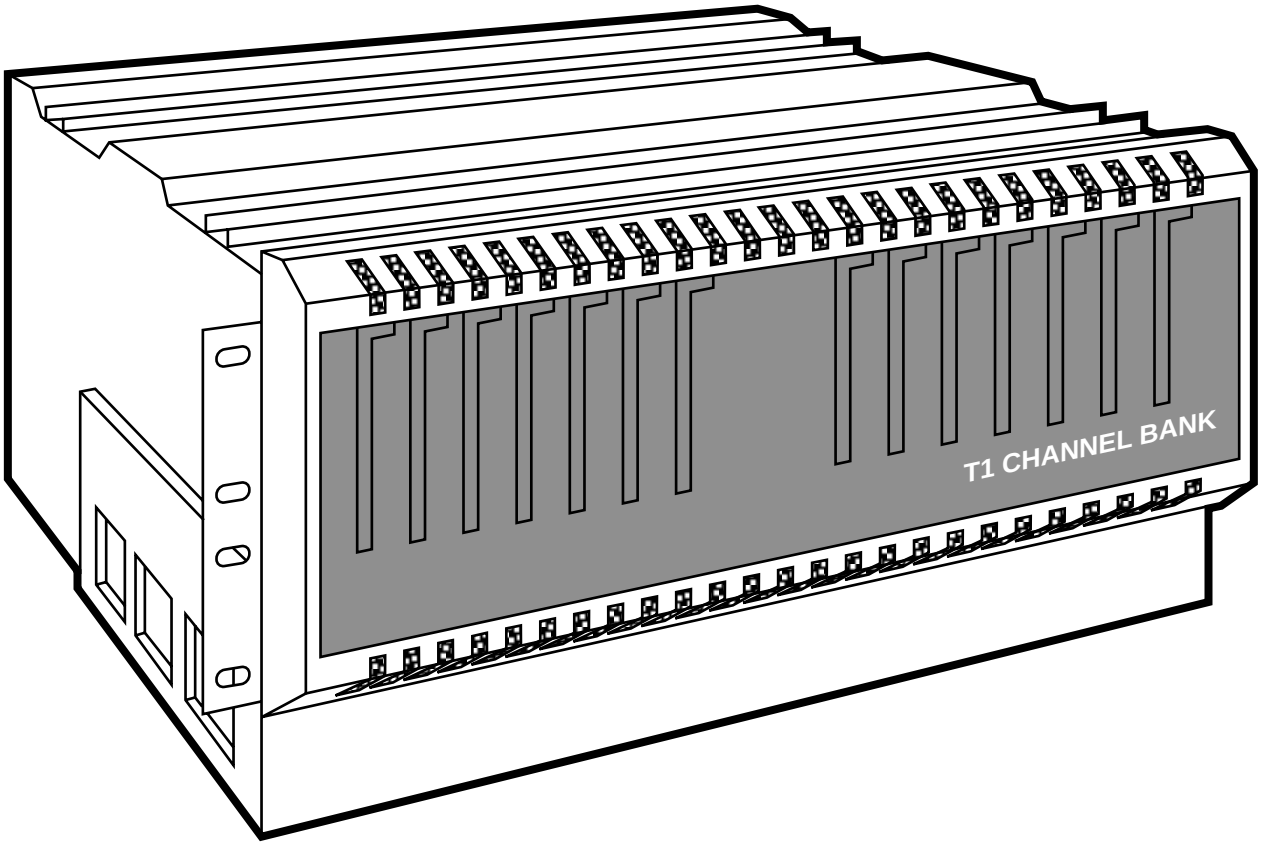
BLACK BOX®
NETWORK SERVICES

AUGUST 1994

MT400A	MT420C-232	MT439C	MT448C	MT462C	MT480C
MT410C	MT420C-35	MT440C	MT450C	MT465C	MT481C
MT412C	MT420C-530	MT441C	MT451C	MT470C	MT482C
MT415C-530	MT430C	MT442C	MT452C	MT471C	MT483C
MT415C-232	MT435C	MT443C	MT453C	MT472C	EHN080-0015-MM
MT415C-35	MT436C	MT445C	MT455A	MT473C	EHN080-0015-MF
MT418C	MT437C	MT446C	MT456A	MT475C	EHN081-0015-MM
MT419C	MT438C	MT447C	MT460C	MT476C	EHN081-0015-MF

T1 Channel Bank



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FEDERAL COMMUNICATIONS COMMISSION

RADIO FREQUENCY INTERFERENCE STATEMENT

Class B Digital Device. This equipment has been tested and found to comply with the limits for a Class B computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or telephone reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an experienced radio/TV technician for help.

CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

To meet FCC requirements, shielded cables and power cords are required to connect this device to a personal computer or other Class B certified device.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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1. Specifications

Aggregate Bit Rate — 1.544 Mbps

Line Code — AMI, B7, B8ZS

T1 Interface — Electrical DSX1, Mechanical DB15 female

Standard Frame Format — D4 (SF), Extended Super Frame (ESF)

Multiplexing Technique — TDM per AT&T PUB 62411

MCC System — Works with standard VT100 or VT52 terminal; configuration data is stored in non-volatile memory on both the MCC plug-in and individual plug-in units; restoration is provided for MCC failure and individual plug-in failure

Network Configurations — End mux, dumb channel bank, soft-configured channel bank, smart channel bank

Channel, Voice — 4 channels per card, E&M Type I, II, III signaling, 2-wire loop or ground start, FXS, DXO, automatic ringdown

Channel, High-Speed Data — N x 56 or N x 64 with N=1 to 24, supporting rates from 56 K to 1.536 Mbps, internal clock,

Interface electrical/connector: V.35/34-position M-block female (DCE), EIA-530/DB25 female (DCE), RS-232/DB25 female (DCE)

Redundancy Options — Power only, Redundant T1s, T1 redundancy and power

Ancillary Equipment — Expansion chassis (additional 14 slots), utility shelf for housing: Redundant power, ring generator, -48V power supply for telephone signaling

Environmental — 32 to 122°F (0 to 50°C) temperature, 10 to 90% relative humidity (non-condensing)

Power — 115-VAC, 60 Hz, 65 watts max., 170 watts total power consumed, -48V DC

Dimensions — 7"H (17.8 cm) (4 RS) without UL® baffle or 8.75"H (22.2 cm) (5 RS) with UL® baffle, 19"W (48.3 cm) x 20"D (50.8 cm)

Weight — 14 lb. (6.4 kg) with baffle and ears (no cards)

2. Introduction

The T1 channel bank is a menu-driven, programmable time-division multiplexer (TDM) that combines 24 channels of voice or data service into a standard 1.544 Mbps trunk. The multiplexing format complies with AT&T® PUB 62411 and is compatible with digital access cross-connect systems (DACS). This includes AT&T Accunet® T1.5 and T1.5 Reserve with both D4 (superframe) and ESF (extended superframe) framing. The T1 Channel Bank is also compatible with microwave, satellite, fiberoptic T1 line facilities, and fractional T1 configurations.

The T1 Channel Bank uses a Single T1 power-supply and MCC (monitor, control, and configure) card.

The architecture of the T1 Channel Bank is a midplane design that accommodates plug-in card sets that come in pairs. One plug-in card inserted into the front end of the chassis contains the circuit function associated with multiplexing. A second plug-in card inserted into the rear matching slot contains the electrical and mechanical interface functions. For example, the quad voice card can use different types of rear cards for interfacing different telephone signaling systems. This makes it easier and less costly to adapt to different applications.

Monitoring, control, and configuration of the T1 Channel Bank is via a VT100™ or VT52™ terminal. This reduces the need to set switches manually on the plug-in cards. Because the T1 Channel Bank provides a number of options to give you greater control over your communications network, you can connect several sites together and control them from one central location. Password protection is provided to allow only authorized entry into the configuration screens.

2.1 Features and Benefits

- Menu-driven network management—Configuration, monitor, and control are administered with a built-in menu-driven management system. Management using a PC or dumb terminal reduces installation, training, and troubleshooting time.
- Reduced Leased-Line Expenses—In a point-to-point application, many leased lines can be combined into one four (4) wire line.
- Modular Design—Allows expansion with minimal cost.Cards can be added as the network grows.
- Toll-quality Voice—Combining high-speed voice and data multiplexing over a single T1 circuit reduces recurring costs. PCM-based voice ensures high quality audio and reliability. FXS, FXO, and E&M interfaces are supported.
- Data Options—High-speed data cards and dual channel cards are available. V.35, RS-530, and RS-232 interfaces are fully supported.
- ModemOptions—Dual channel V.32bis modem card options provide direct connection between a voice channel and each modem. This eliminates the need for a separate modembank and saves money. Ideal for modempooling, remote LAN access, and credit card/point-of-sale applications.
- Supports Multiple Services and Equipment—Data services include: analog modems, dedicated DDS, switched 56, fractional T1 and T1. Voice services include: 800,WATS, and tie lines. Connection of voice PBXs (DSX-1, FXO, or E&M),LAN bridges and routers (V.35,RS-232,or RS-530),CSU/DSUs, and mini/mainframe computers are possible.
- Drop and Insert Capabilities—Allows connection of DSX-1 based devices. For example, PBXs with unused DSOs can connect through the Channel Bank while data is inserted.
- Dual T1 Lines—Two T1 lines can be connected to the channel bank allowing cost savings for larger systems or a backup T1 line for redundancy. If the primary line fails,the secondary line can keep thenetwork operational.
- Built-In CSU—Eliminates the need for an external CSU, saving equipment costs.

2.2 Using This Manual

This manual describes how to install, configure, and use a T1 Channel Bank. Some familiarity with telecommunications is required to understand this manual. It is organized to guide you through the installation and operating process, beginning with the section on "Pre-Installation Considerations." A glossary is included.

In this manual, keys to press on the keyboard for commands to the MCC are shown in **bold** type.

Example: "Access Configure Plug-ins" by pressing **5** and **Enter**. Type the letter of the desired configuration: **A** and **Enter**.

2.3 About T1 and Pulse Code Modulation (PCM)

T1 is a digital transmission method for combining ("multiplexing") multiple voice and/or data channels over two pairs of wires. The channel bank was originally developed by AT&T in the 1960's to expand network capacity and yet still use existing cables and manhole or pole facilities. Through advanced technology, it is possible to send 24 simultaneous telephone conversations over one line.

There are two ways that information of any type can be transmitted: either in analog or in digital form. The analog form transmits signals in a continuous range of frequencies. Most telephone sets today are analog sets that can transmit a given range of frequencies. Analog forms can be encoded into discrete levels and then encoded into a binary word called PCM (Pulse Code Modulation). This digital form can then be multiplexed with other voice channels and transmitted across T1 lines.

2.4 How PCM Transmits Voice Samples

Voice signals are continuous variations of electrical current, which duplicate the changes in acoustical air pressure that we hear as sound. Imagine that a voice analog signal looks like a sine wave.

In PCM, you take a "snapshot" of the sine waves many times each second and give each discrete "picture" a number. Each sample is coded as a digital number representing the electrical voltage value at the sample time. Then you send the numbers of the samples in digital form to the other end. This process is similar to a motion picture in which we perceive continuous motion through a repetitive display of projected snapshots. The ear, like the eye, does not distinguish the discrete samples as long as the repetitive rate is fast enough. PCM samples the voice 8,000 times a second. It measures each sample in 8 bits, encoding one second of voice conversation into 64,000 bits, i.e.: 8 x 8,000.

When a continuous voice signal is converted to a sequence of PCM-coded numbers, the digital signal can then be multiplexed and put into multiple voice channels. The receiving demultiplexor can easily distinguish which PCM sample goes with which voice circuit (conversation). This technique (called Time-Division Multiplexing or TDM) also makes it easy to mix computer data with the voice samples. The equipment needed to combine voice and digital signals is called a multiplexor.

2.5 Multiplexing Is:

- Sharing a data link (line or trunk) among several different pieces of equipment to ensure that the capacity of the link is used efficiently.
- Using a single communications link to transmit a number of different signals, either simultaneously or in rapid succession

There are several methods of transmitting more than one signal over one path: frequency-division multiplexing (FDM), statistical time-division multiplexing (STDM), and time-division multiplexing (TDM). As shown in **Fig. 2-1**, a telecommunication link may be visualized as a medium with some bandwidth, available over a length of time. FDM separates the channels by frequencies, TDM separates the channels by time, and STDM only uses the bandwidth when the channels are active.

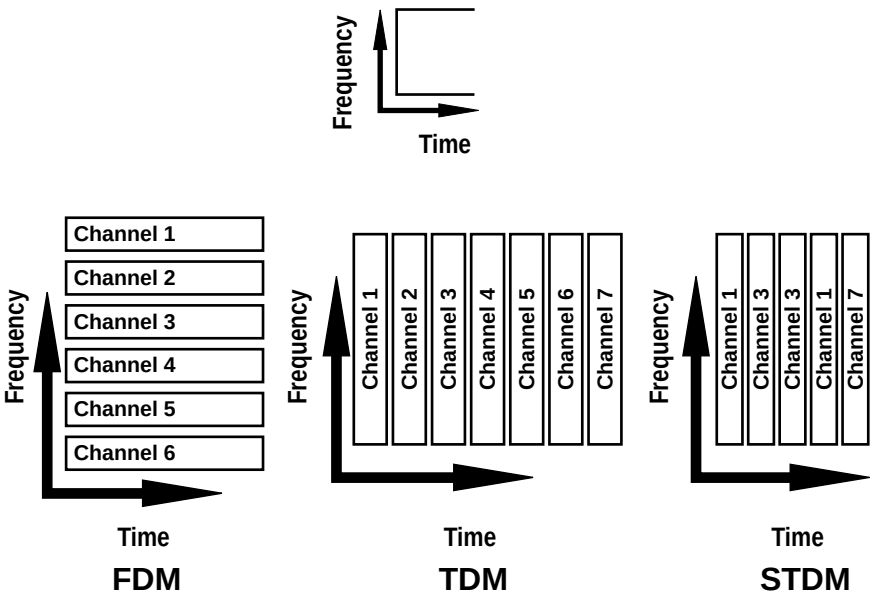


Fig. 2-1. Different Types of Multiplexors.

2.6 Digital Signal Hierarchies

Digital multiplexers are intended to carry as many voice channels as possible over existing inter-exchange cable pairs. Unfortunately, the higher the number of channels that are combined, the shorter the distance the TDM signal can travel without a repeater to boost the signal. In order to facilitate repeater installation under streets, a 24-channel system was adopted in the United States, Canada, and Japan to insure transmission distances equal to every other manhole interval. In comparison, Europe and other parts of the world have adopted a 32-channel system, since they tend to have shorter manhole spacing.

The T1 system described above is the first level in a multilevel TDM hierarchy, which operates at a North American standard speed of 1.544 Mbps (24 channels x 64 Kbps per channel plus 8 Kbps "overhead"), designated as Digital Signal One (DS1). This contrasts with Digital Signal Zero (DS0) which specifies the lowest level of a T1 facility.

See **Table 2-1** for the digital multilevel hierarchy. The physical transmission lines for the higher rates are designated as T2, T3, and T4.

Table 2-1. Digital Multilevel Hierarchy

Level	Channel	Equal DS0	Composite Rate	Trans. Rate
DS0	Voice/data Services	1	64 Kbps	Voice/data circuits
DS1	(24) DS0s	24	1.544 Mbps	T1
DS2	(4) T1s	96	6.312 Mbps	T2
DS3	(7) T2s or 28-T1s	672	44.736 Mbps	T3
DS4	(6) T3s	4032	274.176 Mbps	T4

T=Transmission rate
DS=Multiplexing system

2.7 T1 Message Characteristics

The DS1 naming convention uses 24 eight-bit words (one word for each of the 24 DS0 channels) and one framing bit for a total of 193 bits per frame. The T1 aggregate channel transmits 8000 frames per second so each frame lasts 125 microseconds on the T1 line. Each frame has slot numbers from 1-24. See **Fig. 2-2** for a representation of how time slots comprise frames. Each time slot has space for 8 bits.

The 193rd bits on successive frames follow a pattern (100011011100) for the superframe format. In the T1 Channel Bank, this pattern is checked to ensure synchronization has been maintained. If the receiving T1 Channel Bank can not find the pattern on the 193rd bit, synchronization is lost. Synchronization is crucial for digital transmission. The receiving machine must know which bit goes to which channel.

Data can be inserted in seven (7) bits out of the available 8 of a DS0 for a root rate of 56 Kbps, or all 8 bits can be used for a root rate of 64 Kbps. See **Fig. 2-3** for how bits fit into the frames. The T1 line coding must be B8ZS (bipolar eight zero substitution) to transmit 64 Kbps of data.

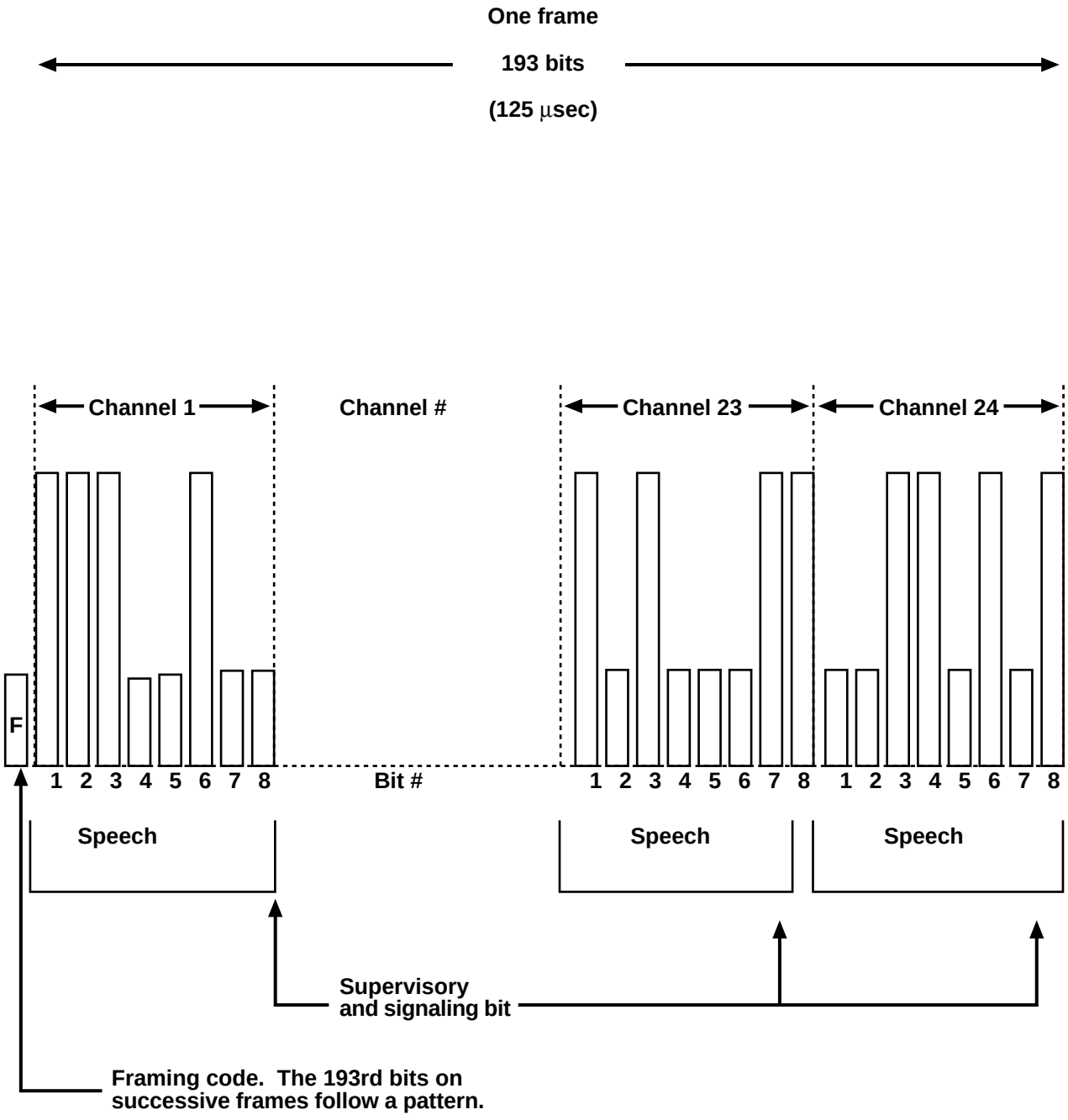
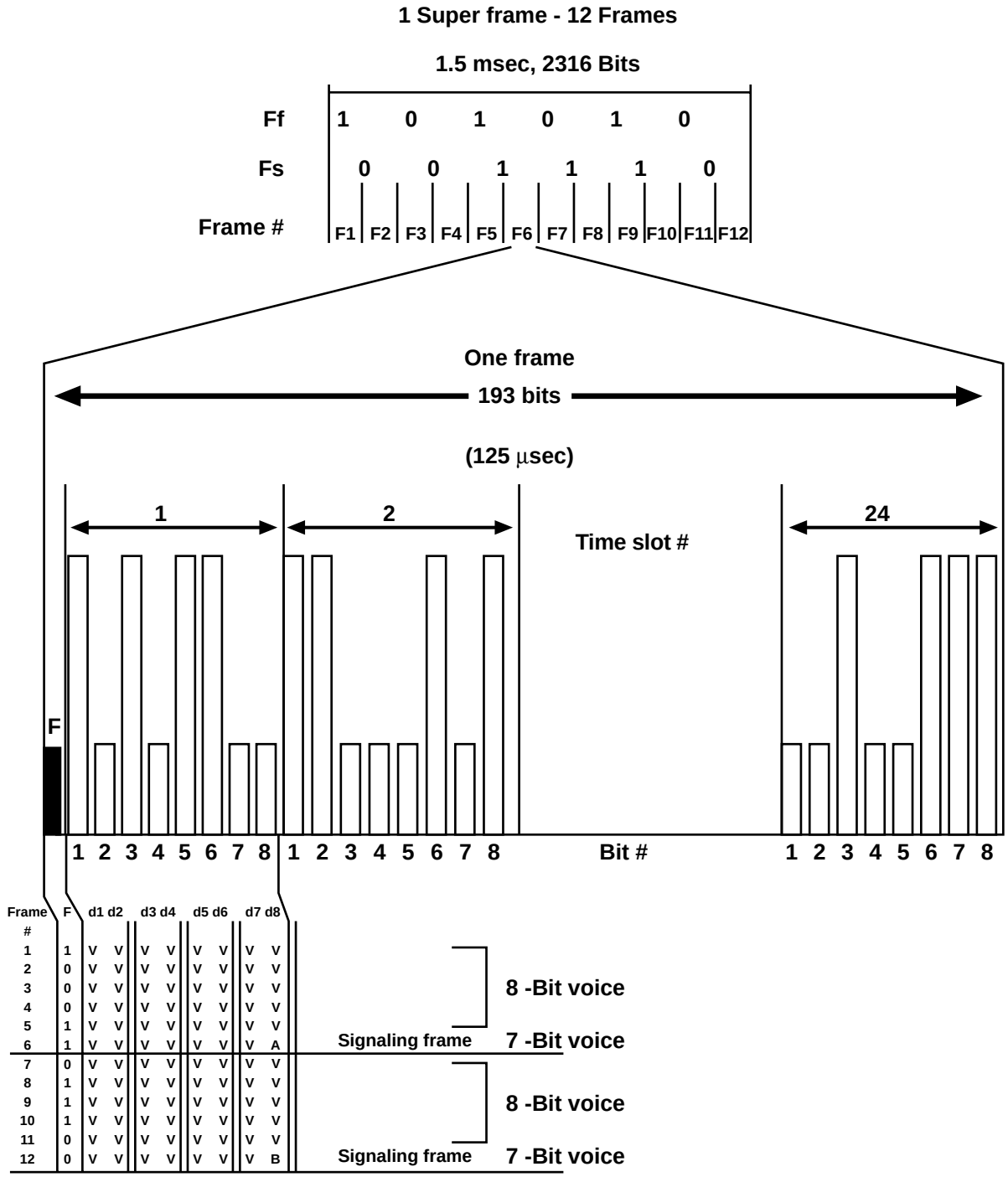


Fig. 2-2. T1 Frame and Time Slots.



V = Bit used for voice/data
A & B = Signaling bits
d = Data (information bits)

Fig. 2-3. D4 Frame (Superframe Format).

2.8 Summary: What Travels over a T1 Circuit?

Voice:

- 800 inbound services from long-distance carrier
- Outbound WATS to long distance carrier
- TIE lines between PBX systems (local or long distance)
- Off-premise extensions (OPX)
- Foreign exchange (FX) circuits

Data:

- Subrate data using external TDM or STAT muxes
- Analog data using existing leased or dialup modems
- 56/64 Kbps data channels for higher bandwidth requirements
- N x 56/64 Kbps for LAN gateway or host-to-host connections (i.e., 256 Kbps, 768 Kbps, etc.)

Video:

- Slow-scan video at 56 Kbps
- N x 56/64 Kbps (i.e., 384, 768 Kbps, etc.)

2.9 Summary: T1 Advantages

- Reduces costs for combining services for those that have more than 8 to 12 dialup or leased telephone lines between two locations and want to combine services over a single circuit
- Combines more than 2 or 3 data lines at 56 Kbps between locations. Facilitates data exchange between locations at speeds greater than 56 Kbps (for high-speed data circuits: LAN, CAD/CAM, file transfer or digitized video)
- Allows more control over your voice or data network
- Aids applications that require redundant paths
- Better quality over poor lines (all digital)
- Uses data compression
- Completely digital end to end

3. System Overview

3.1 Features and Benefits

Toll-Quality Voice

Combining high-speed voice and data multiplexing over a single T1 circuit reduces recurring costs. The T1 Channel Bank supports toll-quality voice through PCM (24 voice channels per T1 span). Voice (800, WATS, TIE lines) and data (analog modem, 56 Kbps, LAN Gateways) are transmitted easily at cost-effective prices.

Standards-Based Architecture

Standard interfaces communicate with T1 services such as the ACCUNET T1.5 and DACS services. All units support fractional T1 services (FT1) offered by the common carriers. The system supports industry-standard D4 formatted PCM equipment and the extended superframe (ESF). It supports voice and data inputs.

Modular Design

Modular design allows expansion capabilities at minimal costs. Future upgrades are as simple as adding new cards, which can be hot-swapped.

Reduced Leased-Line Expenses

In a point-to-point application, many leased lines can be combined into one 4-wire circuit. For long distance applications, up to 24 channels can be combined into one 4-wire circuit terminating at the carrier's POP (point of presence).

Supports Analog Interfaces

Support of multiple analog interfaces: 4-wire E&M, 4-wire for data modems, 2-wire FXS, and 2-wire FXO.

Supports Programmable Data Rates

Support of multiple data bandwidth requirements: 56/64, N x 56, N x 64, where N = 1-24.

Supports DSU/CSU

The OCU-DP card supports two DSU/CSU through two 4-wire interfaces. It supports local and remote loopbacks. The OCU-DP card supports 64, 56 (including switched), and 9.6 Kbps.

Menu-Driven Network Management

Simple but powerful network control is administered through the MCC (Monitor, Control, Configure) Card. Features include loopback control of individual channels, remote alarm monitoring, loopback of individual channels for circuit testing, system alarms and equipment status in real time, dialup access via modems, assigning channel to time slots independent of chassis slots, setting data rates, switch primary or secondary T1 logic sets, and selection of two stored sets of configuration (A or B). Configuration data is stored in non-volatile memory.

Levels of Security

- Configuration, Loopbacks, Monitor
- Loopbacks, Monitor
- Monitor

3.2 System Components

The hardware and software components consist of the following items.

- T1 Channel Bank w/CSU (MT400A)

- (1) T1-CB Front AC Card-65 W (MT435C)

- (1) T1-CB T1 Front Card (MT440C)

- (1) T1-CB MCC Front Card (MT442C)

- (1) T1-CB MCC Rear Card (MT443C)

- (1) T1-CB Main Chassis w/AC (MT455A)

- (1) T1-CB Blank Thin Card (MT462C)

- (1) T1-CB CSU Rear Card (MT465C)

- T1-CB HS Data Card-530 (MT415C-530) This is a kit consisting of the following cards:

- (1) T1-CB HS Data Front Cards (MT450C)

- (1) T1-CB HS RS-530 Rear Cards (MT452C)

- T1-CB HS Data Card-232 (MT415C-232) This is a kit consisting of the following cards:

- (1) T1-CB HS Data Front Cards (MT450C)

- (1) T1-CB HS RS-232 Rear Cards (MT453C)

- T1-CB HS Data Card-V.35 (MT415C-35) This is a kit consisting of the following cards:

- (1) T1-CB HS Data Front Cards (MT450C)

- (1) T1-CB HS V.35 Rear Cards (MT451C)

- T1-CB OCU-DP 56/64 (MT419C) This is a kit consisting of the following cards:

- (1) T1-CB Dual Data Front Cards (MT470C)

- (1) T1-CB OCU-DP Rear Cards (MT476C)

- T1-CB Dual Data Card-232 (MT420C-232) This is a kit consisting of the following cards:

- (1) T1-CB Dual Data Front Cards (MT470C)'

- (1) T1-CB Dual 232 Rear Cards (MT473C)

- T1-CB Dual Data Card-V35 (MT420C-35) This is a kit consisiting of the following cards:

- (1) T1-CB Dual Data Front Cards (MT470C)

- (1) T1-CB Dual V35 Rear Cards (MT471C)

- T1-CB Dual Data Card-530 (MT420C-530) This is a kit consisting of the following cards:

- (1) T1-CB Dual Data Front Cards (MT470C)

- (1) T1-CB Dual 530 Rear Cards (MT472C)

- T1-CB 4W E&M Card (MT410C). This is a kit consisting of the following cards:

- (1) T1-CB Quad Voice Front Card (MT445C)

- (1) T1-CB Quad E&M Rear Card (MT446C)

- T1-CB FXS Card (MT411C) This is a kit consisting of the following cards:

- (1) T1-CB Quad Voice Front Card (MT445C)

- (1) T1-CB Quad FXS Rear Card (MT447C)

- T1-CB FXO Card (MT412C) This is a kit consisting of the following cards:

- (1) T1-CB Quad Voice Front Card (MT445C)

- (1) T1-CB FXO Rear Card (MT448C)

- T1-CB DMC 14.4 Sync (MT425C) This is a kit consisting of the following cards:

- (1) T1-CB DMC 14.4 Front Card (MT480C)

- (1) T1-CB DMC Sync Rear Card (MT481C)

- T1-CB DMC 14.4 Async Card (MT426C) This is a kit consisting of the following cards:

- T1-CB DMC 14.4 Front Card (MT480C)

- T1-CB DMC Async Rear Card (MT483C)

- T1-CB Bat/Ring Gen (MT430C)

- T1-CB Rear AC Card-65 W (MT436C)

- T1-CB Front AC Card-115 W (MT437C)

- T1-CB Front DC Card-65 W (MT438C)

- T1-CB Front DC Card-115 W (MT439C)

- T1-CB DSX-1 Rear Card (MT441C)

- T1-CB Quad Voice Front Card (MT445C)

- T1-CB Main Chassis w/DC (MT456A)

- T1-CB Analog Rear Card (MT460C)

- T1-CB OCU-DP 9.6 Front Card (MT475C)
- T1-CB OCU-DP Rear Card (MT476C)
- T1-CB DMC 19.2 Front Card (MT482C)
- T1-CB DB26M/DB25M Cable (EHN080-0015-MM)
- T1-CB DB26M/DB25F Cable (EHN080-0015-MF)
- T1-CB DB25M/V.35M Cable (EHN081-0015-MM)
- T1-CB DB26M/V.35F Cable (EHN081-0015-MF)

3.3 Component Descriptions

T1 Channel Bank (MT400A)

- The T1 single chassis configuration houses 14 plug-in card sets and one AC power supply. This includes T1 common logic and Monitor Control, and Configuration (MCC) cards (required). The remaining 12 slots can be used for any combination of voice or data cards. Each voice plug-in card provides four voice channels, so 24 voice channels use only 6 of the 12 available slots. The chassis supports two T1 lines in an East and West drop-and-insert configuration or redundant common T1 logic. The chassis uses a mid-plane design. This front/rear card design makes it possible to change the interface (for example, from EIA-530 to V.35) without replacing the more expensive front card. This chassis arrangement pairs the plug-in cards.
- The front plug-in cards contain the circuit functions (voice, data, logic, etc.) and are responsible for data buffering and multiplexing from 1 to 4 channels into an assigned T1 time slot.
- The rear plug-in cards provide the electrical, mechanical, and functional channel interfaces.
- These cards can mate with the front assembly to provide the following:

- 4-wire E&M interface, Type I, II, III
- 2-wire loop or ground start interface for FXS
- 2-wire loop or ground start interface for FXO
- 4-wire interface for analog data modems
- V.35 high-speed data
- RS-530 high-speed data
- RS-232 low-speed data
- OCU-DP for DSU/CSU operation

MCC Logic Set

Monitor, Control, Configuration (MT442C)

The MCC front plug assembly is a microcontroller to permit communications with a system operator and the various hardware elements of the system. The microcontroller operates the VT100 or VT52 menus, stores the shelf configuration, and communicates with shelf plug-in cards.

Three levels of MCC security are standard:

- Level 1 adds configuration control of the T1 aggregate and all logic cards with the ability to do loopbacks and monitoring.
- Level 2 allows loopback control of individual channels and monitoring.
- Level 3 is monitor only.

Quad Voice Logic Set 4 Wire E&M Card (MT410C)

This set consists of a front PCM logic card (MT445C) and a rear interface card (MT446C). The rear card provides Type I, II, and III signaling. It has 4 modular 8- pin connectors. This card provides direct termination of 4 wire E&M voice channels on the T1 Channel Bank. It has an RJ-45 connector.

Quad Voice Logic Set 2 Wire FXS (MT411C)

This set consists of a front PCM logic card (MT445C) and a rear interface card (MT447C). The rear card is a 2-wire loop or ground start interface for foreign exchange subscriber use. It has 4 modular 6-pin RJ-11 connectors. A tone card for ringback tone is provided.

Quad Voice Logic Set 2 Wire FXO (MT412C)

This set includes a front PCM logic card (MT445C) and a rear interface card (MT448C). The rear card is a 2-wire loop or ground start interface for foreign exchange office use. It has 4 modular 6-pin RJ-11 connectors.

4 Wire Analog Card Logic Set (MT418C)

This set includes a front PCM logic card (MT445C) and a rear interface card (MT460C). The rear card is used to interface analog data modems for voice-band transmission over a T1 circuit. It provides a transmission level of +13 TLP (transmission level point) on the transmit pair and -3 TLP on the receive pair. It has 4 modular 8-pin RJ-45 connectors.

High Speed Data Logic Set V.35 (MT415C-35)

This set consists of 2 front high-speed data cards (MT450C) and 2 rear interface cards (MT451C). The rear card is capable of operating in increments of 56 or 64 Kbps up to 1344 or 1536 Kbps. The V.35 card uses one 34-pin female connection. Use the V.35 card when you want digital access at rates up to 1536 Kbps for CAD/CAM systems, high-speed facsimile, LAN interfaces, and teleconferencing systems.

High Speed Data Logic Set RS-530 (MT415C-530)

This set includes 2 front high-speed data cards (MT450C) and 2 rear interface cards (MT452C). The rear card uses one DB25 female connection. It is a balanced 422 interface capable of operating in increments of 56 or 64 Kbps up to 1536 Kbps.

High Speed Data Logic Set RS-232 (MT415C-232)

This set consists of 2 front high-speed data cards (MT450C) and 2 rear interface cards (MT453C). The rear card uses one DB25 female connection. This card is useful for connecting a small number of point-to-point RS-232 data circuits through the network. It can operate at speeds up to 56 or 64 Kbps.

Subrate Dual Data Card 56/64 (MT419C)

This set consists of a sub-rate two-channel front card (MT470C) and a two-channel OCU-DP rear card (MT476C). The rear card uses two RJ-45s for connections to the two DSU/CSU via a 4-wire interface. This card set supports 56 Kbps and 64 Kbps.

Dual Data Card Set V.35 (MT420C-35)

This set consists of a dual-channel front card (MT470C) and a rear two-channel V.35 card (MT473C). The rear card uses two DB26 miniature connectors for the interface. Use cable 6930-34 or 6930-35 for a true Amp 34-pin connector. This card set supports speeds of 56 or 64 Kbps only.

Dual Data Set RS-530 (MT420C-530)

This set includes a dual-channel front card (MT470C) and a rear two-channel RS-530 card (MT472C). The rear card uses two DB26 miniature connectors for the interface. Use cable 6930-32 or 6930-33 for a DB25 interface. This card set supports speeds of 56 or 64 Kbps only.

Dual Data Set RS-232 (MT420C-232)

This set has a dual-channel front card (MT470C) and a rear two-channel RS-232 card (MT473C). The rear card uses two DB26 miniature connectors for the interface. Use cable 6930-32 or 6930-33 for a DB25 interface. This card set supports speeds of 56 or 64 Kbps only.

Dual Modem Card Set 19.2 Sync (MT425C)

The front card is the MT480C. The sync rear card, MT481C, has DB26 connectors.

Dual Modem Card Set 19.2 Async (MT426C)

The front card is the MT480C. The async rear card, MT483C, has two RJ-45 connectors. It operates from 300 bps to 19.2 Kbps.

3.4 Network Applications

You can set up a variety of data communications network configurations with the Network management via a menu-driven system with the operating software residing on the MCC card. For example, the T1 Channel Bank can be monitored, controlled, and configured for the various applications via a user-friendly terminal. This reduces the need to set switches manually on the plug-in cards. See **Fig. 3-1**.

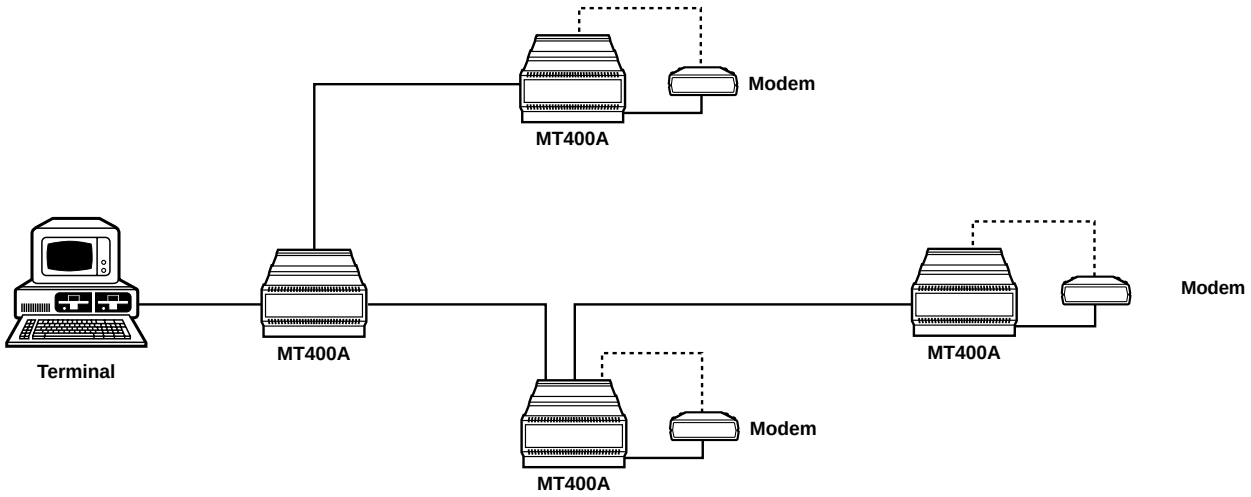


Fig. 3-1. MCC Control of Multiple Sites Using DS0 Channel or Dial Network in Case of Failure.

For new installations, the T1 logic cards must be set to the proper frame configuration, and the T1 must be entered correctly into the system network timing plan and coordinated with the master clock. The MCC communicates with the VT100 or VT52 terminals through a serial RS-232 data link on the rear MCC card.

Application #1: Data Only or Voice and Data

T1 combines multiple voice channels over one set of wires going to various locations. You can use telephone-company services, or you can use your own microwave, satellite, coaxial-cable, or fiberoptic links between sites. The set of rear plug-in cards provides economical flexibility to interface with standard telephone equipment. An interface for analog modems permits integration of 3002 private-line voice-band services with digital access facilities. In sending data, you can achieve higher speeds than the limit of 9600 bps or the 56 Kbps of DDS circuits. See **Fig. 3-2**.

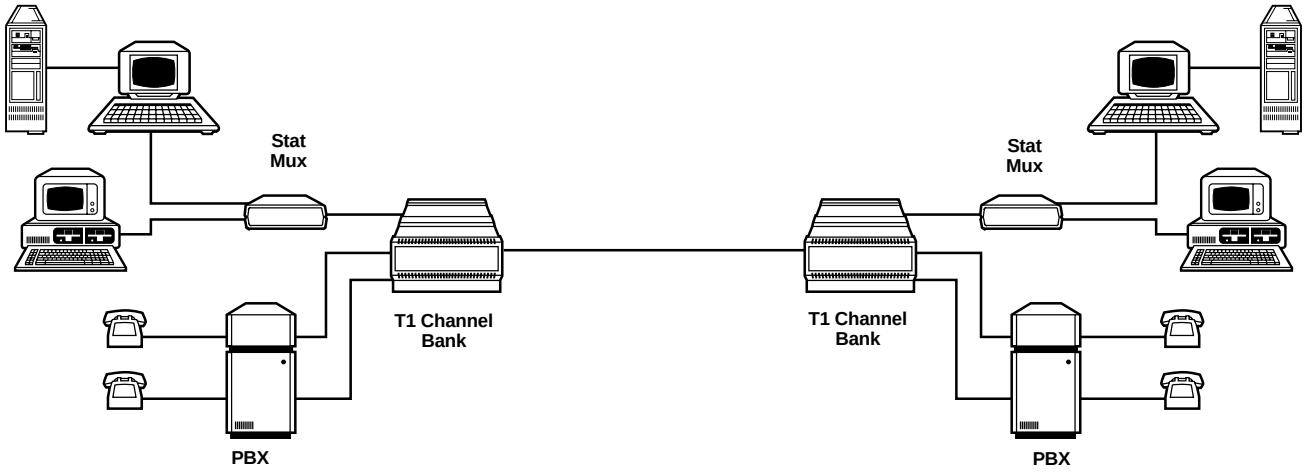


Fig. 3-2. Data-Only or Voice-Plus-Data Communications.

Application #2: Point-to-Point

You can increase throughput in increments of N x 56 Kbps or N x 64 Kbps (where N = 1 to 24) all the way to 1,536 Kbps. Typical applications include bridging your local area networks (LANs), connecting CAD/CAM workstations, and even video for slow-scan or data-compressed teleconferencing. See **Fig. 3-3**.

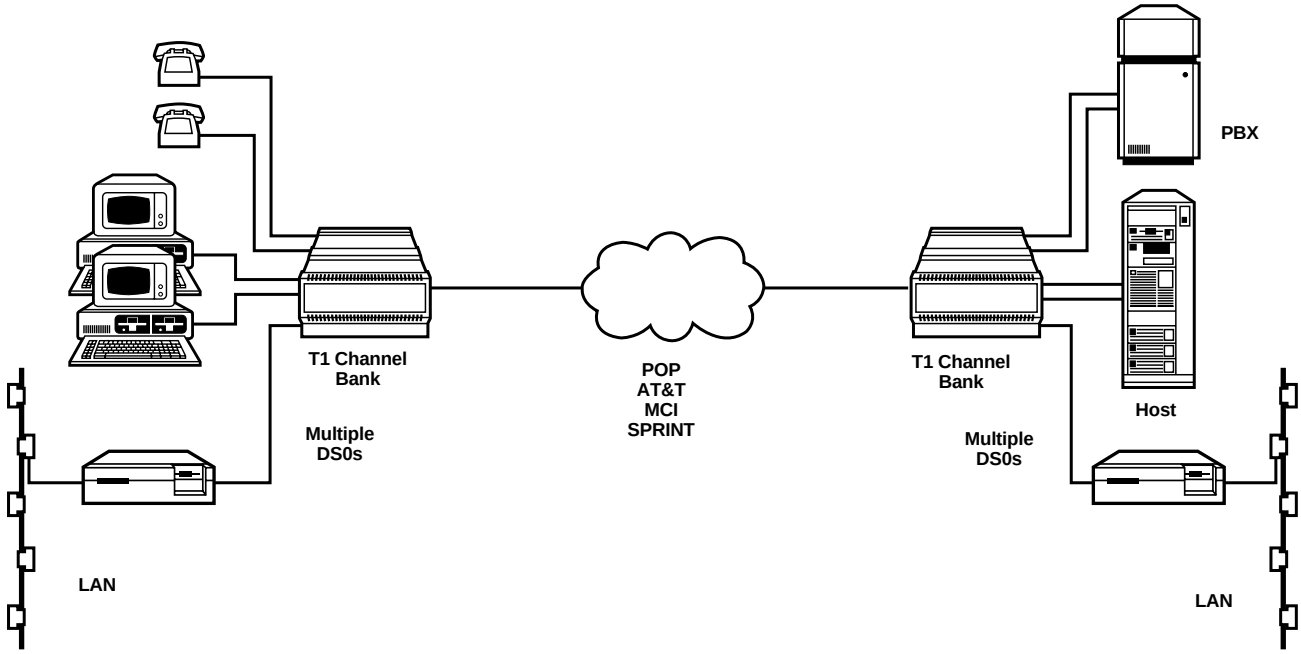


Fig. 3-3. Point-to-Point Multiplexing: High-Speed Data.

Application #3: Fractional T1 Networking

Using network standards, the T1 Channel Bank can connect several sites together using fractional T1 facilities as a backbone. The DACS at the central office will route DS0s to your destination. Fractional T1 operates N x 56 and N x 64. With an MCC installed in the T1 Channel Bank, this subset of the T1 applications allows you to use and pay for only the bandwidth that you need and not for extra channels. See **Fig. 3-4**.

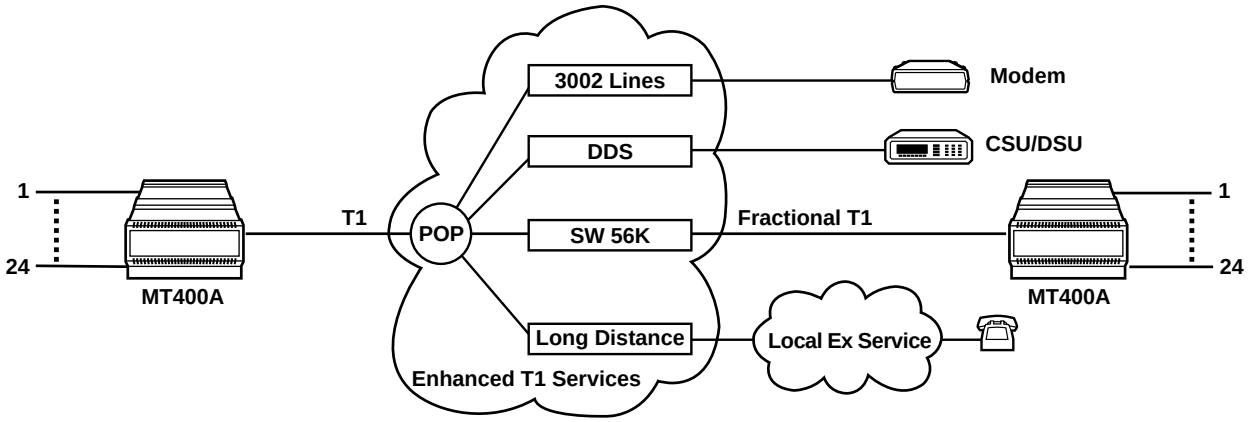


Fig. 3-4. Fractional T1 Networking.

Application #4: OCU-DP Card Sets

If you have a DSU/CSU network already in place and want to take advantage of the DSU/CSU network management system (NMS), the T1 Channel Bank can still be placed into the network to save line cost and still allow the DSU/CSU NMS to function. See **Fig. 3-5**.

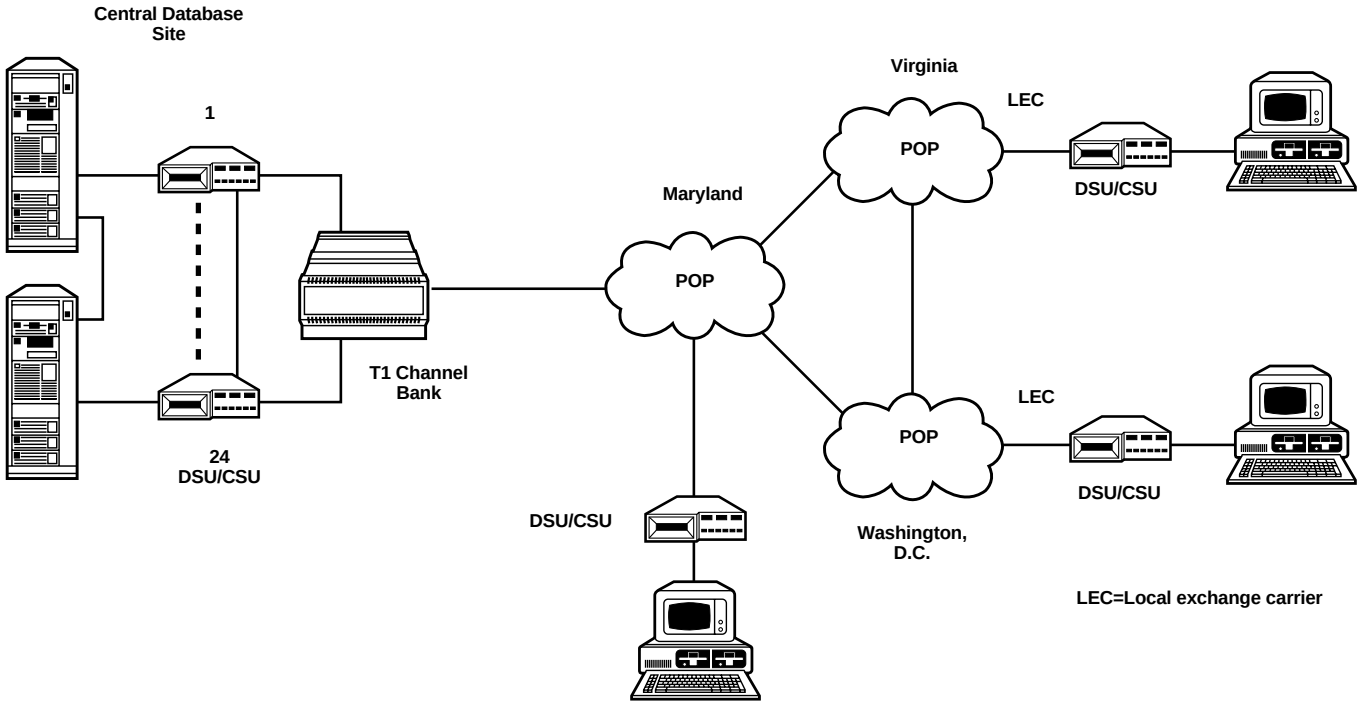


Fig. 3-5. OCU-DP Application.

Application # 5: Dual Modems

Dual modem cards save rack space. In standard dial-in applications with channel banks and modems, a typical application could look like **Fig. 3-6** and require 28 inches of rack space compared to the 7 inches required by the DMC. For example, multiple modems from the field dial in to make a connection to the host at the central site. The telco acts as a rotary group for the modems. For the standard application, these are the space requirements:

- T1 Channel Bank— 7 inches (17.78 cm)
- Standard Modem Rack

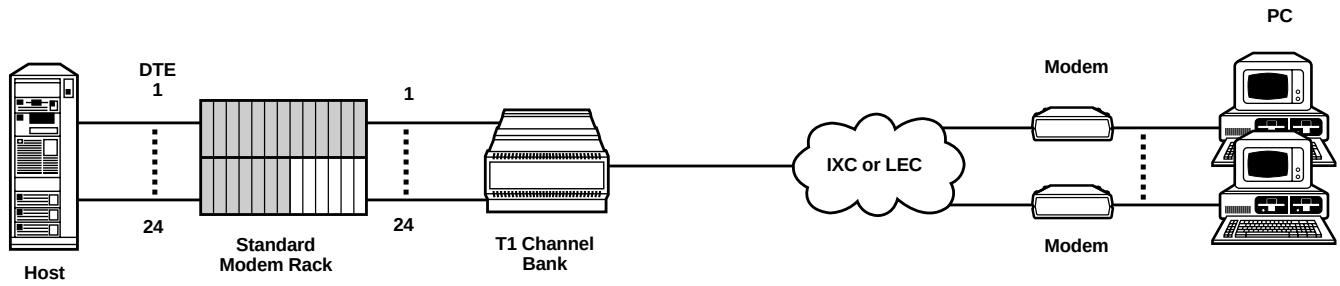


Fig. 3-6. A Standard Dial-In Application with Channel Banks and Modems.

Making a Standard Dial-in Call

- A modem from the field calls in to an 800 number at the central site.
- The telco signals the T1 Channel Bank incoming call.
- The FXS card rings the local modem.
- After 2-6 seconds, the local modem answers the call and starts the handshake with remote modem.
- It takes from 12 to 30 seconds to finish the handshake. This includes type of modulation scheme, MNP® error correction, and speed.
- The modems connect and the PC attaches to the host.

Disconnecting

- The PC disconnects from the remote modem and DTR drops.
- The remote modem goes on hook.
- The telco signals the T1 Channel Bank of the on-hook condition.
- The FXS card drops the loop to the central modem.
- The modem disconnects from the host.
- Total time is 2-10 seconds.

*Disadvantages of Standard Dial-in Application (**Fig. 2-6**)*

- It takes 12-36 seconds to get the modems to train.
- Because the disconnect takes time, the modems are not available for the next call.
- Three conversions are necessary—analog to digital (far end), digital to analog, and analog to digital (near-end). This conversion accounts for loss of signal quality, and it increases the S/N ratio.

*Advantages of the Dual Modem Card (**Fig. 3-7**)*

With the DMC, fewer modems give the same amount of blocking. Using the DMC in the T1 Channel Bank, you gain several advantages as shown in **Fig. 2-7**:

- No analog card (FXS) in the prod name.
- No analog in the central modem.
- Connect and disconnect times can be less than one second.
- You have a better S/N ratio and fewer errors.
- The DMC requires only 7 inches of rack space.

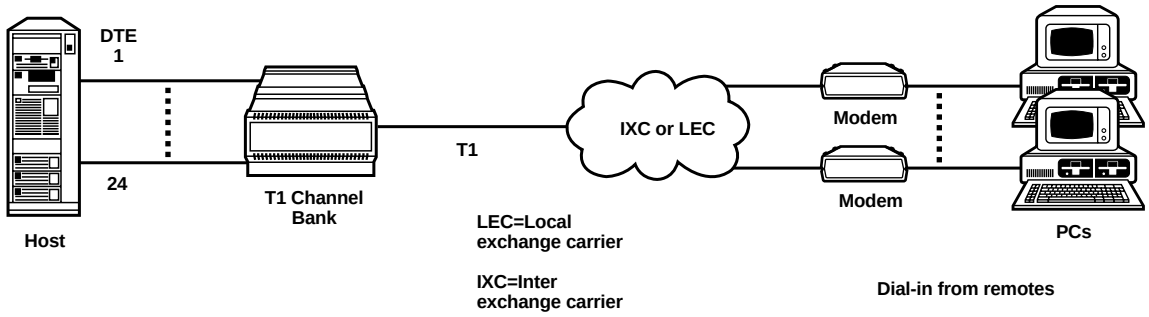


Fig. 3-7. Dual Modem Card Application.

Making a Call with the DMC

- A modem from the field calls in to an 800 number at the central site.
- Telco signals the Channel Bank, which attaches the modem immediately.
- The modem connects in a few seconds, attaching the PC to the host.

Disconnecting with the DMC

- The PC disconnects from the remote modem and DTR drops.
- The remote modem goes on hook.
- Telco signals the Channel Bank of the on-hook condition and drops DTR to host. This takes less than one second.
- The modem is available for the next call.

4. Pre-Installation Considerations

4.1 Unpacking

The T1 Channel Bank is shipped with proper shock insulation material. If you need to return the unit for any reason, use the original shipping carton. Failure to comply may result in voiding the equipment warranty. Follow this procedure while unpacking the unit:

1. After opening the shipping carton, locate the packing list and check the contents. Besides this guide, you should find all the items that you ordered. Verify this with your ordering information. DO NOT handle bare printed circuit cards before you read this caution:

CAUTION

Components on the printed circuit cards will be damaged by electrostatic discharge. Use proper grounding techniques for all tools and work areas when you handle these cards. While installing or removing the printed circuit cards, GRASP BY THE EDGE ONLY. Take care not to touch any circuit paths, component leads, or edge connectors.

2. Inspect all the items for damage that may have occurred during shipment. If there is damage, contact the shipping agent. If you have further questions about damaged or missing parts, contact your dealer.

3. Using the inventory forms in **Table 4-1** and **Table 4-2**, record all part/model numbers, software revision identifiers, and card/slot positions for components that belong to each chassis. There is a separate inventory form for chassis 1 and for chassis 2. Write on this form as you unpack the items from the shipping carton and inspect them. If there is a need to contact your dealer for any reason later concerning some of these parts, you have an accurate reference.

4. Turn to **Appendix B** and complete the site survey before installing the T1 Channel Bank. Having the information on hand will make installation easier. It will also alert you to areas that may require more preparation before you begin the installation.

Table 4-1. Chassis 1 Inventory Form

Item	Description	Part Number	Serial Number	Software Revision Number	Card Slot Position
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					

Table 4-2. Chassis 2 Inventory Form

Item	Description	Part Number	Serial Number	Software Revision Number	Card Slot Position
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					

4.2 Installation Procedure

Recommended Sequence:

1. Unpack the equipment. (See **Section 4.1**.)
2. Identify the pieces required for your configuration and verify plug-in cards. (Compare with order information.)
3. Install the shelf in a permanent location. (See **Chapter 5**.)
4. Begin the hardware configuration setup. (See **Chapter 6**.)
5. Set headers and install plug-in cards. Power up the system. (See **Chapter 7**.)
6. Configure network management menu choices. (See **Chapter 8** and **Chapter 9**.)
7. Make software configuration menu choices. (See **Chapter 10**.)
8. Set up the system network timing plan. (See **Chapter 11**.)
9. Run short tests to verify that the equipment functions satisfactorily. (See **Chapter 12**.)

4.3 Operating Environment

Site Location

In addition to the space required by the T1 Channel Bank and its accessories, as shown in **Table 4-3** below, the site plan must take into consideration the space requirements for addressing the I/O cables, termination blocks, etc. A site survey is included in **Appendix B**. See **Table 4-22** for general cable guidelines. A minimum maintenance access aisle of 2 is recommended for troubleshooting and plug-in card replacement, both in front of and behind fixed racks.

Table 4-3. Space Requirements.

Unit	Height, inches	Width, inches	Depth, inches	Rack Spaces
Channel Bank shelf	7	19	20	4
Utility shelf	7	19	20	4
Ring generator/ power supply	5-1/4	2-3/4	7-1/2	1 KTU space
UL® baffle	1-3/4	19	20	1

FCC Rules, Part 68 require that all T1 equipment interfacing to 1.544-Mbps digital services and the public switched telephone network must be registered under FCC Part 68 or be installed behind registered protective circuitry.

The chassis can be mounted in a rack. Use the mounting ears for front flush-mounting as in a cabinet, or they can be attached further back for center gravity rack mounting. See **Fig. 4-1**.

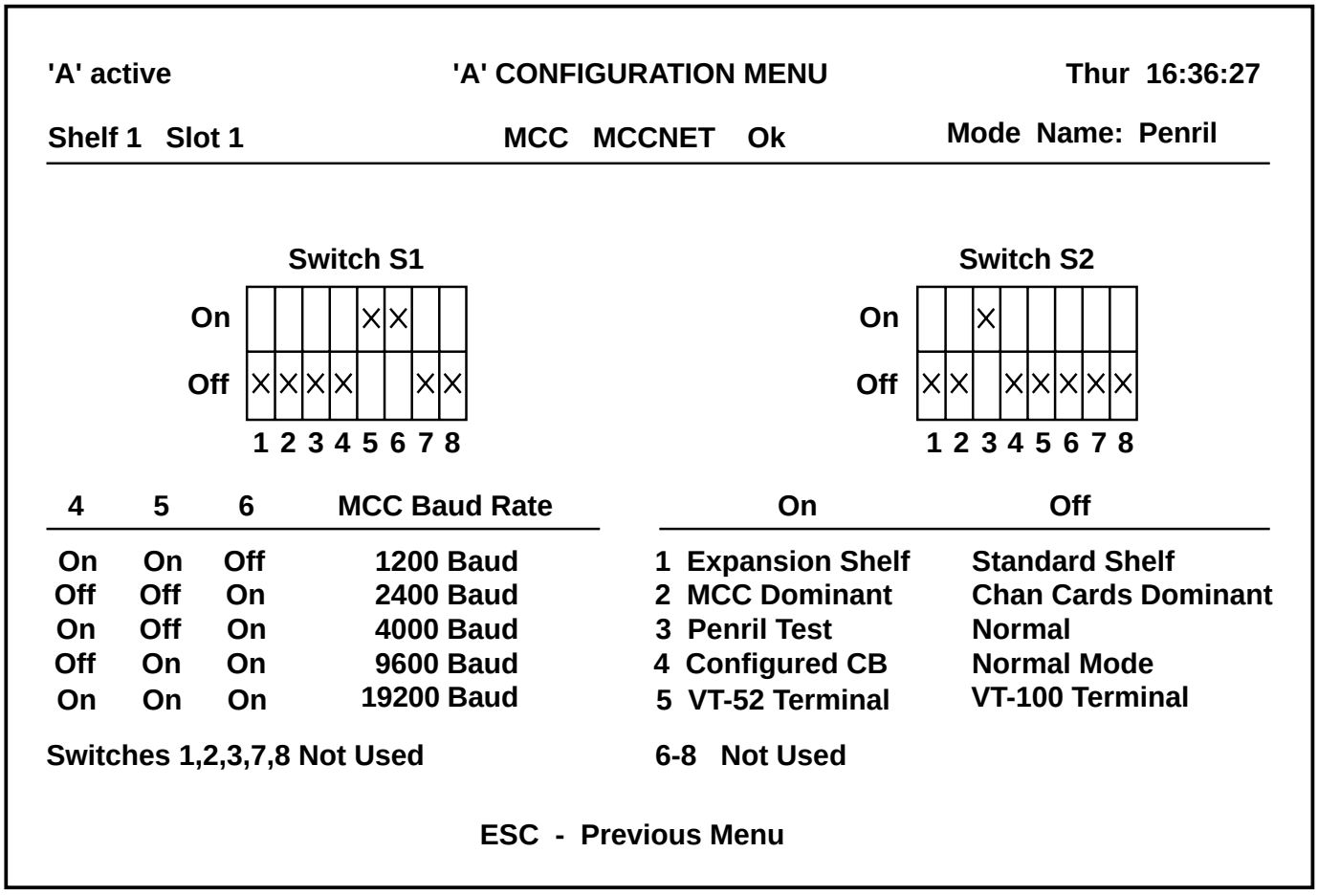


Fig. 4-1. Front Mount and Mid-Rack Mounts.

Power Requirements

Channel Bank Shelf:

- 115-VAC ±10% 60 Hz or -48 VDC
- Single shelf (fully loaded): 65 watts or 115 watts
- Dual shelves with power redundancy: 195 watts, 345 watts

AC or DC Ring Generator/48V Power Supply:

- -48 1.5 VDC at 1.25 A, switch selectable (overload protected at 1.10 to 1.40 times rated load)
- Nominal 96 VAC, 86 Vrms minimum, 150 V peak maximum (when switched off, output less than 0.5 V)
- 20 1 Hz

Table 4-4. Ring Power Requirements

Interface	24 Channel Group	
	-48 V	Ring voltage
4W E&M	Required	N/A
2W FXS	Required	Required
2W FXO	Required	N/A
OCU-DP	Required	N/A
DDC OCU-DP	Required	N/A
High Speed Data	N/A	N/A
DMC	N/A	N/A

48 V and Ring Power Requirements:

Environmental Conditions

Temperature: 0°C to 50°C

Humidity: 10-90% relative humidity, non-condensing

4.4 Cabling Requirements

As with any installation of this type of equipment, you should complete a cabling plan prior to installation. Complete the site survey in **Appendix B**. See the following pages for some wiring pin diagrams and the list of cables.

Your plan should address the following:

- Placement of power outlets
- Ground wires
- T1 cables
- Voice cables
- Termination blocks
- Data cables
- MCC cables
- Special cables (control and alarm cabling)

Having a ground plan is important for the following reasons:

- It provides a ground path for ground start and E&M signaling circuits.
- It provides electrical safety.
- It prevents unwanted radio-frequency signals.
- It prevents ground loops.

There are three ground circuits:

- Frame (or chassis) ground
- Battery/ring ground
- Power ground

See **Fig. 4-2** for proper grounding. The ground wire should be 6-gauge twisted copper wire, and the reading should be 0-2 ohms.

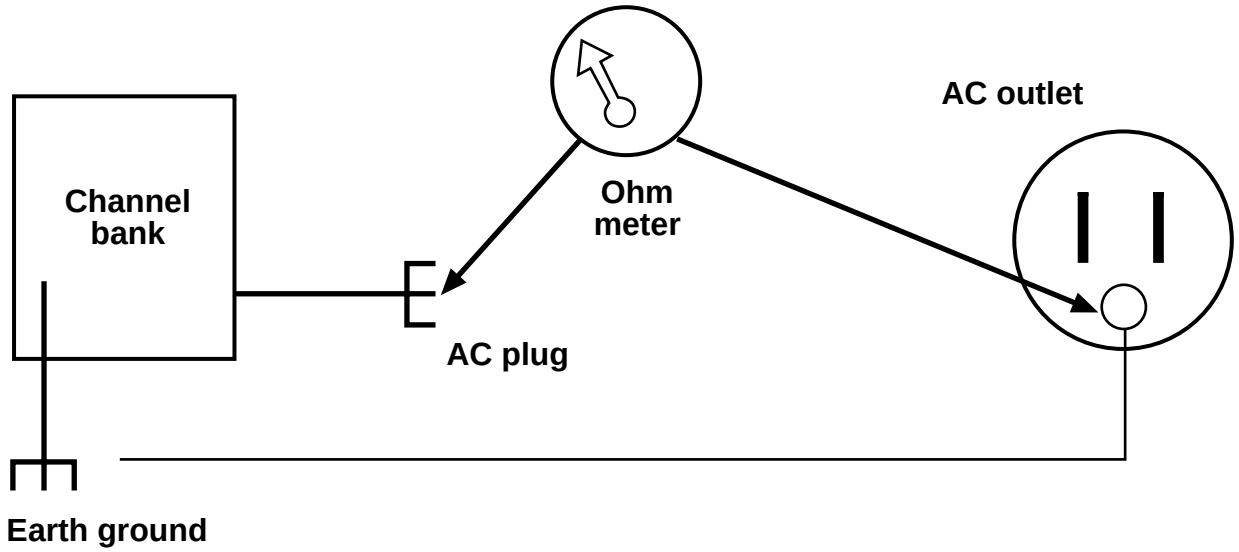


Fig. 4-2. Ground Plan for Installation.

4.5 Wiring Pin Diagrams

DSX-1 Card (MT441C)

Refer to **Fig. 4-3** to locate the parts for the pin assignments in **Tables 4-5** through **4-7**.

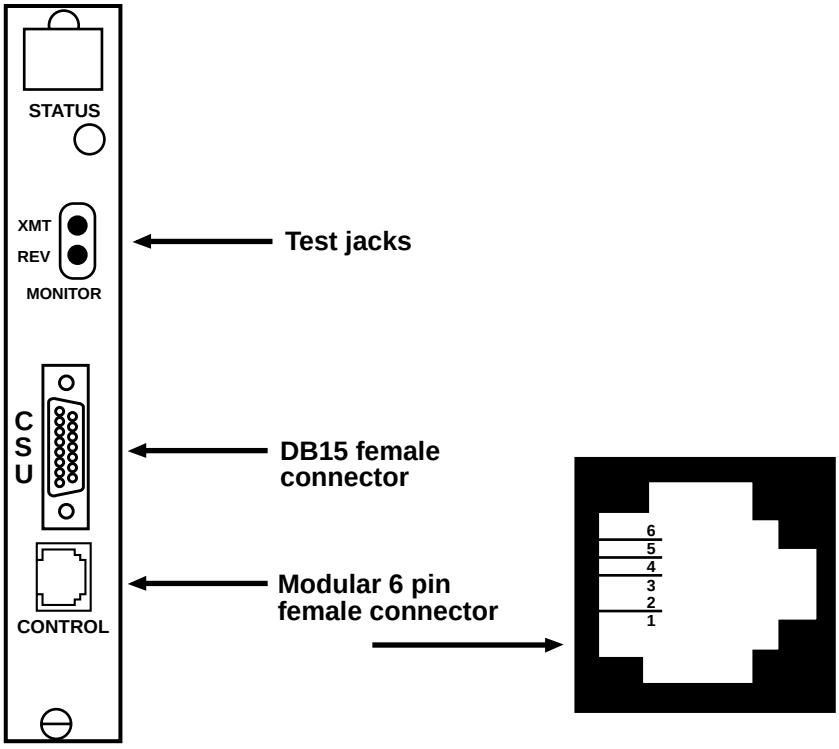


Fig. 4-3. DSX-Card Connectors.

Table 4-5. Control Interface Assignments Used for Redundant T1 Logic Cards.

RJ-11 Pin	Lead Name
1	+5V
2	+12V
3	GND
4	GND
5	Control signal
6	Control signal

Table 4-6. CSU Interface Assignments

Pin	Lead Name	Direction
1	TX Tip	Out
2	GRD TX 1, 9	—
3	RX Tip	In
4	GRD RX 3, 11	—
5	Not connected	
6	Not connected	
7	Not connected	
8	Not connected	
9	TX Ring	Out
10	Not connected	
11	RX Ring	In
12	Not connected	
13	Not connected	
14	Not connected	
15	Not connected	

CSU Rear Card (MT465C)

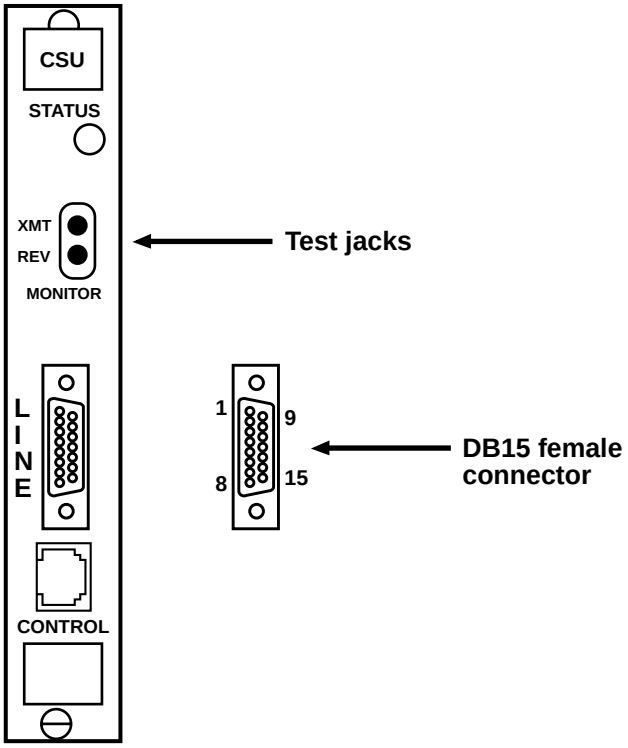


Fig. 4-4. CSU Rear Card.

Table 4-7. DSX-1 Rear Card with CSU.

DB15	Lead Name	Direction
1	XMT data (T1)	Out
2	Frame GND	—
3	RCV data (T)	In
4	Frame GND	—
9	XMT data (R1)	Out
11	RCV data (R)	In

MCC Rear Card (MT443C)

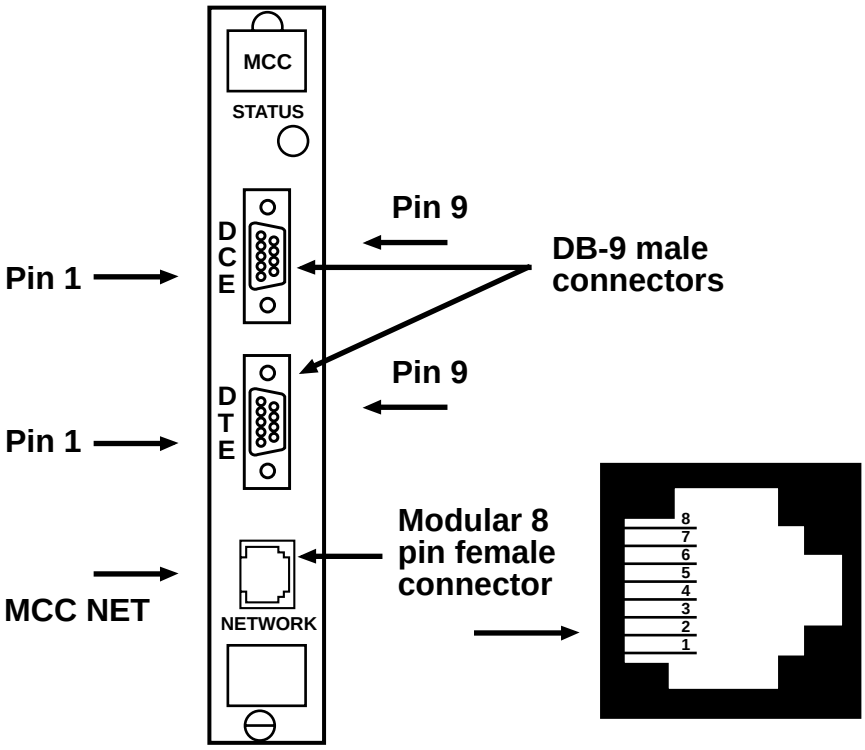


Fig. 4-5. MCC Rear Card Connectors.

Table 4-8. MCC Rear Card Interfaces.

DB9 Pin	DCE	Direction	DTE	Direction
1	Not connected		DCD	In
2	RxD	Out	RxD	In
3	TxD	In	TxD	Out
4	DTR	In	DTR	Out
5	GND	Not used	GND	Not used
6	DSR	Out	DSR	In
7	RTS	In	Not connected	
8	CTS	Out	Not connected	
9	Not connected		Not connected	

Table 4-9. MCC Net Series 6000 Interface.

RJ-45 pin	DTE	Direction
4	GND	Not used
5	RX data	In
6	TX data	Out

FXS 2 Wire Voice and FXO 2 Wire Voice

FXS (MT411C), FXO (MT412C)

These diagrams show all four circuits. See **Fig. 4-6** and **Table 4-10**.

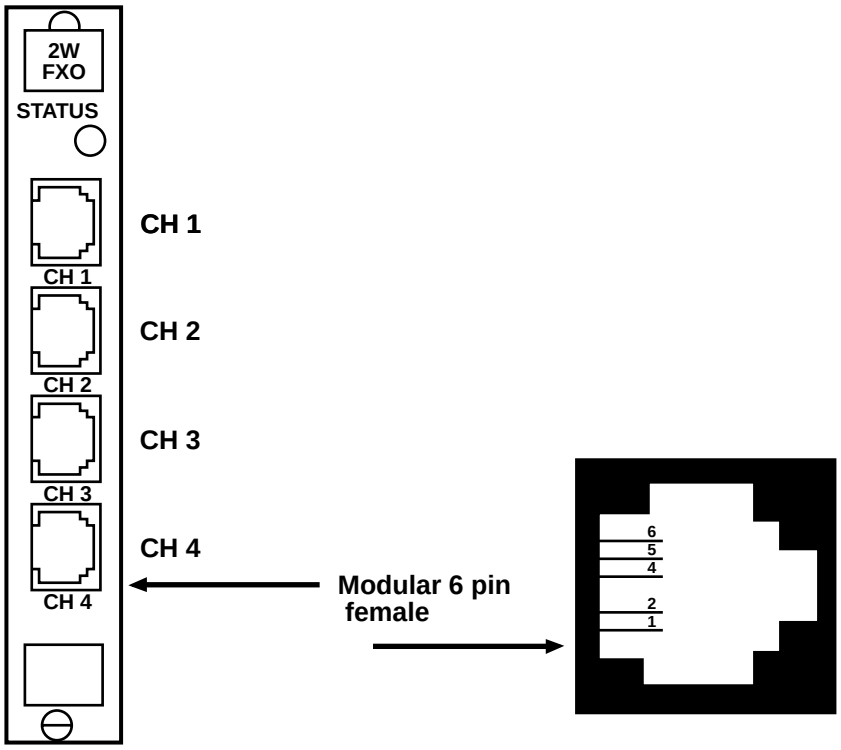


Fig. 4-6. FXS and FXO 2-Wire Voice Connectors.

Table 4-10. FXS and FXO 2-Wire Voice Interface

RJ-11 pin	Lead name
1	Not connected
2	Not connected
3	RING
4	TIP
5	Not connected
6	Not connected

4-Wire E & M Voice (MT410C)

All four circuits are shown in these pinouts. See **Fig. 4-7** and **Table 4-11**.

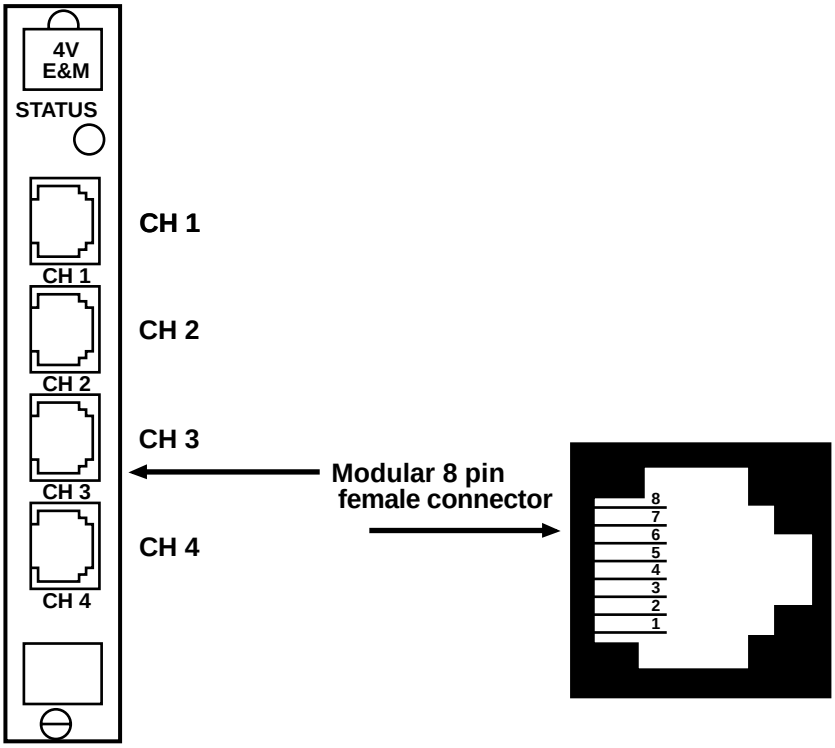


Fig. 4-7. 4-Wire E&M Voice Connectors.

Table 4-11. 4-Wire E&M Voice Interface.

RJ-45 pin	Lead name	Signal direction
1	E (Ear)	Out
2	M (Mouth)	In
3	T1 (Tip)	Out
4	R (Ring)	In
5	T (Tip)	In
6	R1 (Ring)	Out
7	EG (E-lead Ground)	—
8	MB (M-lead Battery)	—

4 Wire AD (Analog) (MT418C)

All four circuits are identical and are shown in these pinouts. See **Fig. 4-8** and **Table 4-12**.

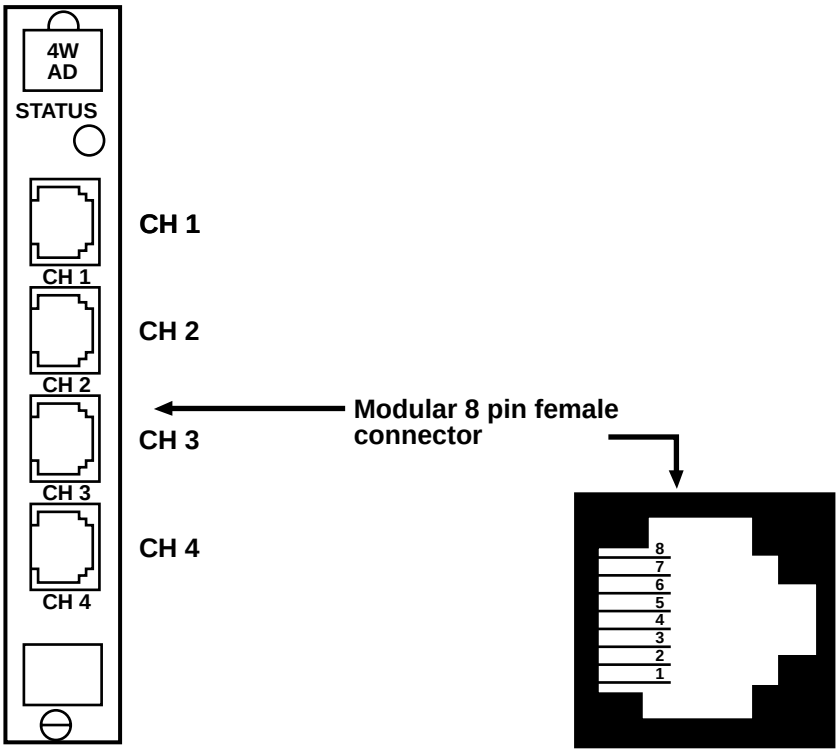


Fig. 4-8. 4-Wire AD Connectors.

Table 4-12. 4-Wire AD (Analog) Interface.

RJ-45 pin	Lead name	Signal direction
1	Not connected	
2	Not connected	
3	T1 Tip	Out
4	R Ring	In
5	T Tip	In
6	R1 Ring	Out
7	Not connected	
8	Not connected	

V.35 Data (MT451C)

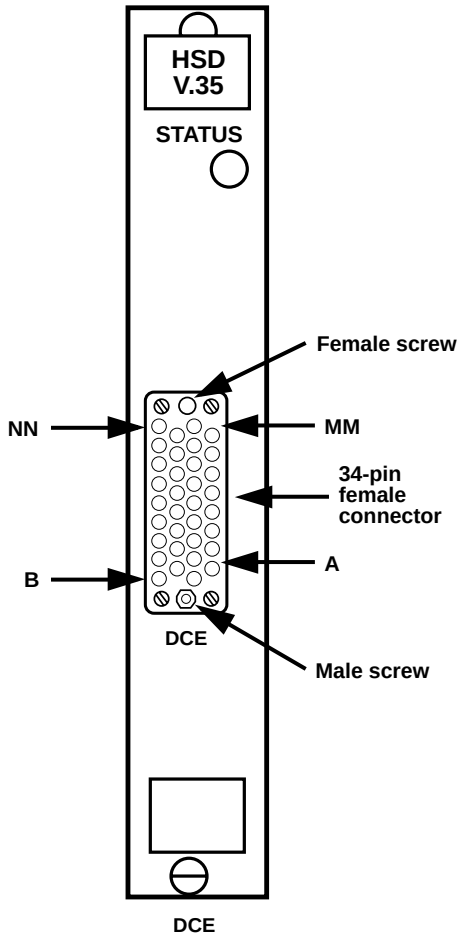


Fig. 4-9. V.35 Data Connectors.

Table 4-13. V.35 DCE Interface.

Pin	Lead name	Signal direction
A	Frame ground	—
B	Signal ground	—
C	RTS	In
D	CTS	Out
E	DSR	Out
F	DCD	Out
H	DTR	In
P	TxD—A	In
R	RxD—A	Out
S	TxD—B	In
T	RxD—B	Out
U	TTxC—A	In
V	RxC—A	Out
W	TTxC—B	In
X	RxC—B	Out
Y	TxC—A	Out
AA	TxC—B	Out

RS-232 (MT453C)

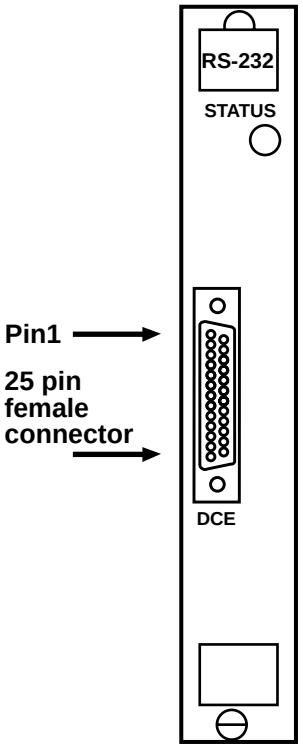


Fig. 4-10. RS-232 Connectors.

Table 4-14. RS-232 Interface.

Pin	Lead name	Signal direction
1	Chassis GND	
2	TxD	In
3	RxD	Out
4	RTS	In
5	CTS	Out
6	DSR	Out
7	Signal GND	
8	DCD	Out
9	Not connected	
10	Not connected	
11	Not connected	
12	Not connected	
13	Not connected	
14	Not connected	
15	Tx CLK	Out
16	Not connected	
17	Rx CLK	Out
18	Not connected	
19	Not connected	
20	DTR	In
21	Not connected	
22	Not connected	
23	Not connected	
24	Ext CLK	In
25	Not connected	

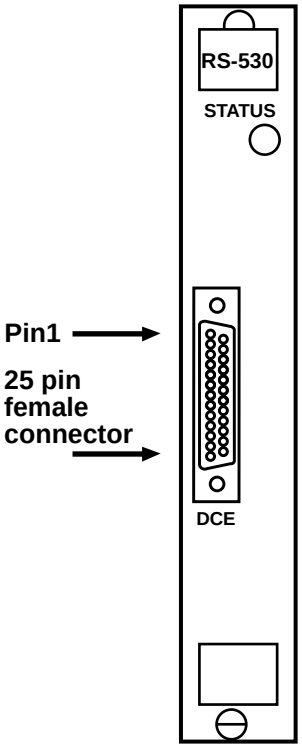


Fig. 4-11. RS-530 Connectors.

RS-530 (MT452C)

Table 4-15. RS-530 Interface.

Pin	Lead name	Signal direction
1	Chassis GND	
2	TxD—A	In
3	RxD—A	Out
4	RTS—A	In
5	CTS—A	Out
6	DSR—A	Out
7	Signal GND	
8	DCD—A	Out
9	RxC—B	Out
10	DCD—B	Out
11	TTxC—B	In
12	TxC—B	Out
13	CTS—B	Out
14	TxD—B	In
15	TxC—A	Out
16	RxD—B	Out
17	RxC—A	Out
18	Not connected	
19	RTS—B	In
20	DTR—A	In
21	Not connected	
22	DSR—B	Out
23	DTR—B	In
24	TTxC—A	In
25	Not connected	

Office Channel Unit Data Port (MT476C)

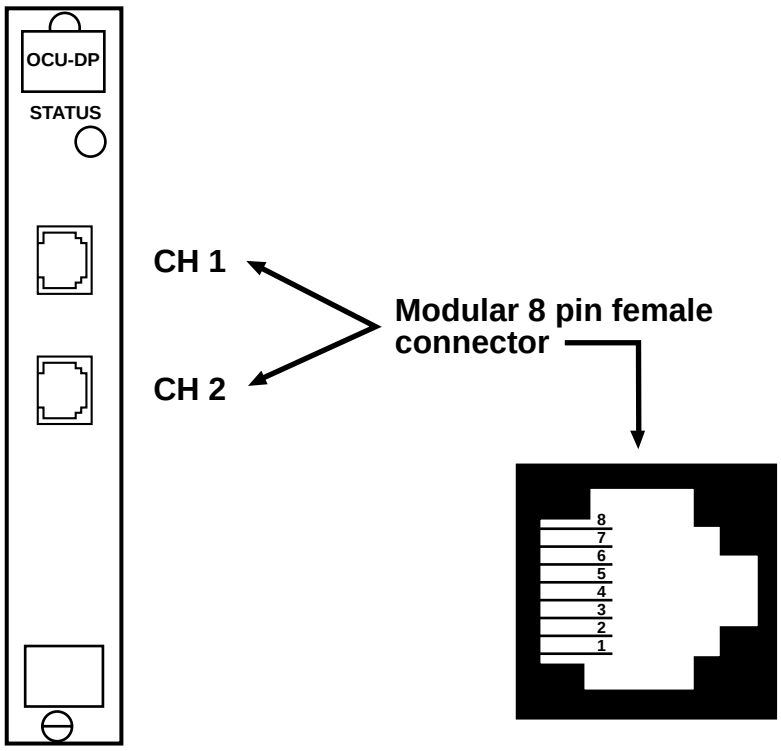


Fig. 4-12. Office Channel Unit Data Port.

Table 4-16. OCU-DP Interface.

RJ-45S Channels 1 and 2	Lead name	Direction
1	Receive data (Tip)	Input
2	Receive data (Ring)	
3		
4	Not used	Not used
5		
6		
7	Transmit data (Ring) (R1)	Output
8	Transmit data (Tip) (T1)	

DSU RS-232 Dual Data Connector (MT473C)

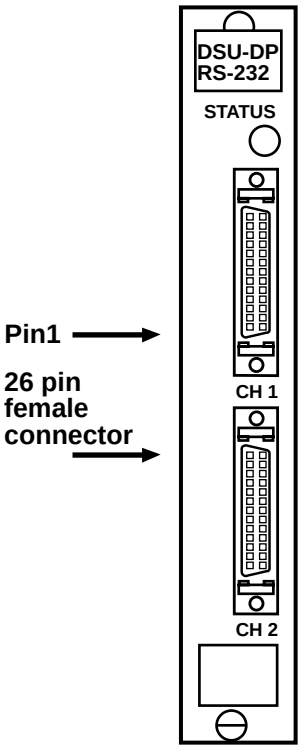


Fig. 4-13. Dual Data RS-232 Connector.

Table 4-17. DSU RS-232 Interface.

Pin	Lead name	Signal direction
1	Chassis GND	
2	TxD	In
3	RxD	Out
4	RTS	In
5	CTS	Out
6	DSR	Out
7	Signal GND	
8	DCD	Out
9	Not connected	
10	Not connected	
11	Not connected	
12	Not connected	
13	Not connected	
14	Not connected	
15	Tx CLK	Out
16	Not connected	
17	Rx CLK	Out
18	Not connected	
19	Not connected	
20	DTR	In
21	Not connected	
22	Not connected	
23	Not connected	
24	Ext CLK	In
25	Not connected	
26	Shield and chassis ground	

DSU RS-530 Dual Data Connector (MT472C)

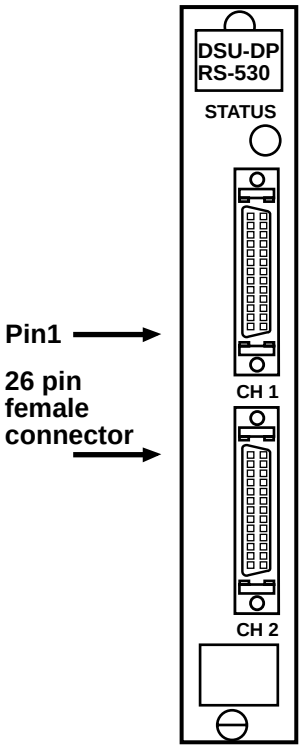


Fig. 4-14. Dual Data RS-530 Connector.

Table 4-18. DSU RS-530 Interface.

Pin	Lead name	Signal direction
1	Chassis GND	
2	TxD—A	In
3	RxD—A	Out
4	RTS—A	In
5	CTS—A	Out
6	DSR—A	Out
7	Signal GND	
8	DCD—A	Out
9	RxC—B	Out
10	DCD—B	Out
11	TTxC—B	In
12	TxC—B	Out
13	CTS—B	Out
14	TxD—B	In
15	TxC—A	Out
16	RxD—B	Out
17	RxC—A	Out
18	Not connected	
19	RTS—B	In
20	DTR—A	In
21	Not connected	
22	DSR—B	Out
23	DTR—B	In
24	TTxC—A	In
25	Not connected	
26	Shield and chassis ground	

DSU V.35 Dual Data Connector (MT471C)

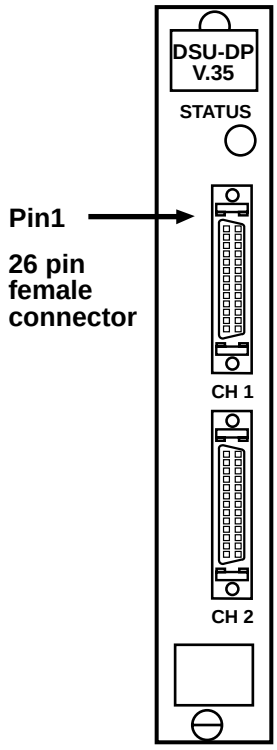


Fig. 4-15. High Density DSU V.35 Connector.

Table 4-19. DSU V.35 Interface.

Pin	Lead Name	Signal Direction
1	Frame ground	—
2	TxD—A	In
3	RxD—A	Out
4	RTS	In
5	CTS	Out
6	DSR	Out
7	Signal ground	—
8	DCD	Out
9	RxC—B	Out
11	TTxC—B	In
12	TxC—B	Out
14	TxD—B	In
15	TxC—A	Out
16	RxD—B	Out
17	RxC—A	Out
20	DTR	In
24	TTxC—A	In

Dual Modem Rear Cards (6950-43, -45)

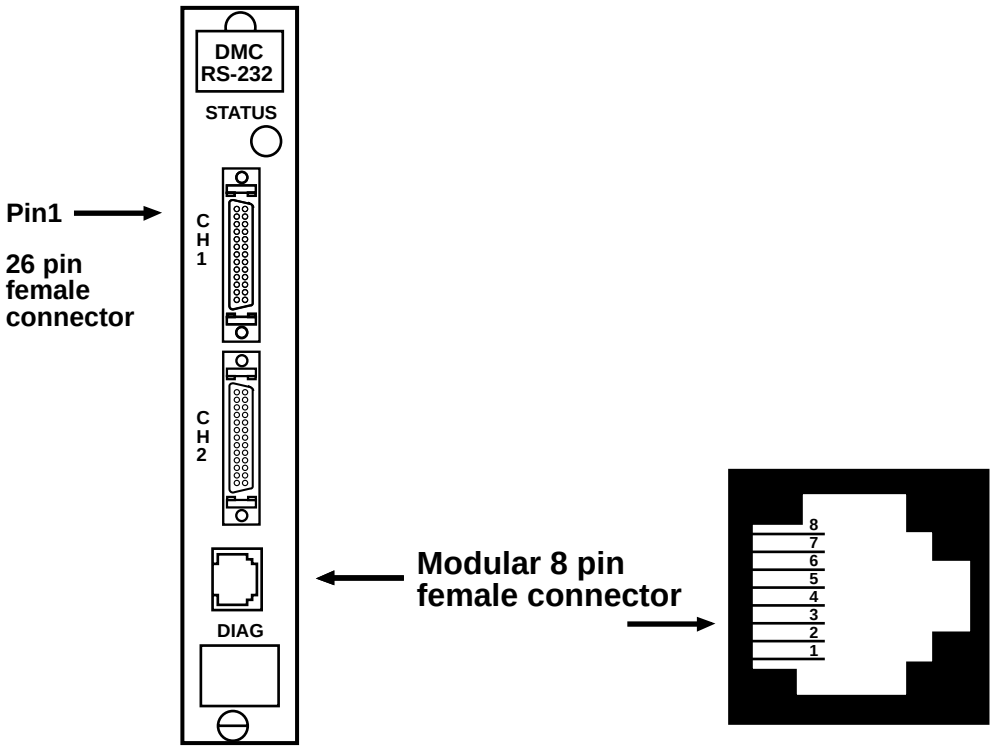


Fig. 4-16. Dual Modem Rear Card Connectors for RS-232, RS-530, V.35, or RJ-45.

Table 4-20. Dual Modem Rear Card Interface.

RS-232 Jacks								
RS-232 Pin	Lead name	Direction	Pin	RS-530 Lead name	Direction	Pin	V.35 Lead name	Direction
1	Frame ground	—	1	Frame ground	—	1	Frame ground	—
2	TxD	In	2	TxD—A	In	2	TxD—A	In
3	RxD	Out	3	RxD—A	Out	3	RxD—A	Out
4	RTS	In	4	RTS—A	In	4	RTS	In
5	CTS	Out	5	CTS—A	Out	5	CTS	Out
6	DSR	Out	6	DSR—A	Out	6	DSR	Out
7	GND	—	7	GND	—	7	GND	—
8	DCD	Out	8	DCD—A	Out	8	DCD	Out
9	—	—	9	RxC—B	Out	9	RxC—B	Out
10	—	—	10	DCD—B	Out	10	DCD	—
11	RI	In	11	TTxC—B	In	11	TTxC—B	In
12	SI	Out	12	TxC—B	Out	12	TxC—B	Out
13	—	—	13	CTS—B	—	13	—	—
14	—	—	14	TxD—B	In	14	TxD—B	In
15	TxC	Out	15	RxD—B	Out	15	TxC—A	Out
16	—	—	16	RxD—B	Out	16	RxD—B	Out
17	RxC	Out	17	RxC—A	Out	17	RxC—A	Out
18	ALB	In	18	—	—	18	—	—
19	—	—	19	RTS—B	In	19	—	—
20	DTR	In	20	DTR—A	In	20	DTR	In

Table 4-20. Dual Modem Rear Card Interface.

RS-232 Jacks								
RS-232 Pin	RS-530 Lead name	V.35 Direction	Pin	Lead name	Direction	Pin	Lead name	Direction
21	RDL	In	21	—	—	21	—	—
22	RI	Out	22	DSR—B	Out	22	—	—
23	SS	In	23	DTR—B	In	23	—	—
24	TTxC	In	24	TTxC—A	In	24	TTxC—A	In
25	TM	Out	25	—	—	25	—	—

Table 4-21. Dual Modem Rear Card Interface for RJ-232.

RJ-232 Jacks, DCE		
Pin	Lead name	Direction
1	DSR	Out
2	DCD	Out
3	DTR	In
4	GND	Power
5	RxD	Out
6	TxD	In
7	CTS	Out
8	RTS	In

4.6 List of Cables

Table 4-25. T1 Channel Bank Cables.

Part number	Item description
EHN080-0015-MM	HD DB26M—DB25M
EHN081-0015-MF	HD DB26M—V.34/M34F
EHN080-0015-MF	HD DB26M—DB25F
EHN081-0015-MM	HD DB26M—V.35/M34 M
EHN082	T1-CB Utility Pwr Cable

4.7 List of Parts with Part Numbers

Table 4-23. Parts to Order (Excluding the Cables).

Part number	Item Description
MT400A	14-slot chassis (included in basic unit of T1 Channel Bak)
MT437C, MT435C	AC power front card (included in basic unit of T1 Channel Bank)
MT436C	AC rear module (included with chassis)
MT400A	T1 logic front card (included in basic unit of T1 Channel Bank)
MT400A	T1 logic rear card (included in basic unit of T1 Channel Bank)
MT442C	MCC logic front card (included in basic unit of T1 Channel Bank)
MT443C	MCC logic rear card (included in basic unit of T1 Channel Bank)
MT400A	Basic unit: T1 mux
	Hardware options
	Monitor control configure (MCC card)
MT445C, MT446C	Quad voice card—E&M
MT445C, MT447C	Quad voice card—FXS
MT445C, MT448C	Quad voice card—FXO
MT450C, MT451C	High speed data—V.35
MT450C, MT452C	High speed data—RS-530
MT450C, MT453C	High speed data—RS-232
MT418C	4-wire analog card (for modems)
	T1 common logic cards
	T1 common logic cards with CSU
MT475C, MT476C	OCU-DP subrate 9600
MT420C-35	Dual V.35 card set
MT420C-530	Dual RS-530 card set
MT420C-232	Dual RS-232 card set
MT482C, MT481C	Dual modem card 19.2 with DB25
MT482C, MT483C	Dual modem card 19.2 with RJ-45
MT425C	T1-CB Dual ModemCard 14.4 Sync
MT426C	T1-CB Dual Modem card 14.4 Async
MT415C-35	T1-CB HS Data Card-V.35
MT415C-530	T1-CB HS Data Card-530
MT415C-232	T1-CB HS Data Card-232
MT410C	T1-CB 4W E&M Card
MT411C	T1-CB FXS Card
MT412C	T1-CB FXO Card
MT430C	T1-CB Bat/Ring Gen
MT419C	T1-CB OCU-DP 56/64
MT440C	T1-CB T1 Front Card
MT441C	T1-CB DSX-1 Rear Card
MT465C	T1-CB CSU Rear Card
MT457	T1-CB Utility Shelf w/AC

Table 4-23. Parts to Order (Excluding the Cables) (continued).

Part number	Item Description
	Hardware spare parts
MT435C, MT437C	AC power front card
MT436C	AC power rear card
	T1 logic front card
	T1 logic rear card
MT442C	MCC front card
MT443C	MCC rear card
MT445C	Quad voice front card
MT446C	Quad E&M rear card
MT447C	Quad FXS rear card
MT448C	Quad FXO rear card
MT450C	High speed data front card
MT451C	High speed data V.35 rear card
MT452C	High speed data RS-530 rear card
MT453C	High speed data RS-232 rear card
	14-slot chassis with rear AC power module (low power)
	Utility shelf (low power)
	Redundant logic relay
	Quad 4-wire E&M with levels 0/0
MT460C	Analog rear card
MT462C	Blank rear card—thin
MT470C	Dual data high speed front card
MT476C	OCU-DP dual rear card
	DC power rear card (low power)
MT471C	Dual V.35 rear card
MT472C	Dual RS-530 rear card
MT473C	Dual RS-232 rear card
	Dual high speed subrate front card
MT438C	DC power front card, 65 watts
MT439C	DC power front card, 115 watts
MT437C	AC power front card, 115 watts

Table 4-23. Parts to Order (Excluding the Cables) (continued).

Part number	Item Description
MT482C	14-slot chassis with DC power (low power) Expansion chassis with DC power (low power) Dual modem card V.32bis front Dual modem card with DB25 rear Dual modem card 19.2 front Dual modem card with RJ-45 rear 14-slot chassis (new, high power) with AC Rear AC power module (high power) Rear DC power module (high power) New 14-slot chassis (high power)

4.8 Installation Time

Installation normally takes a few hours to complete, but it varies according to application and how familiar the installer is with the equipment on the premises.

4.9 Installation Equipment

- VT100, VT52, equivalent terminal, or PC emulation software
- Small screwdriver set to secure rear plug-in assemblies
- Screwdriver for 19" rack-mounting

4.10 Optional Installation Equipment

- T1 test equipment
- Voice-signaling test equipment
- Bit error rate test set
- Ohmmeter

5. Shelf Description and Installation

5.1 Standard Single Shelf

The standard 14-slot chassis is 7" high without the heat baffle (fits 4 rack units) or 8.75" high with the heat baffle (5 rack units). It weighs 14 pounds with baffle and ears assembly and without any plug-in assemblies. It is 20" deep and 19" wide. See **Fig. 5-1**.

The standard shelf assembly houses 14 plug-in cards that can be inserted into any slot position. When the shelf assembly is ordered from the factory as a basic unit, it comes with a power supply (front and rear), T1 (front and rear) card, and MCC (front and rear) card. Any card can be assigned to any channel through the MCC. If you choose the dumb mode of operation— with no MCC and voice only— use table 1 for card placement. The cards must be installed as explained in the following pages.

If a card is in the dumb mode, it will be reported to the MCC as in the dumb mode. You can set the switches on the MCC to the soft-configured channel bank mode and program the channel bank for dumb mode. Then you can remove the MCC.

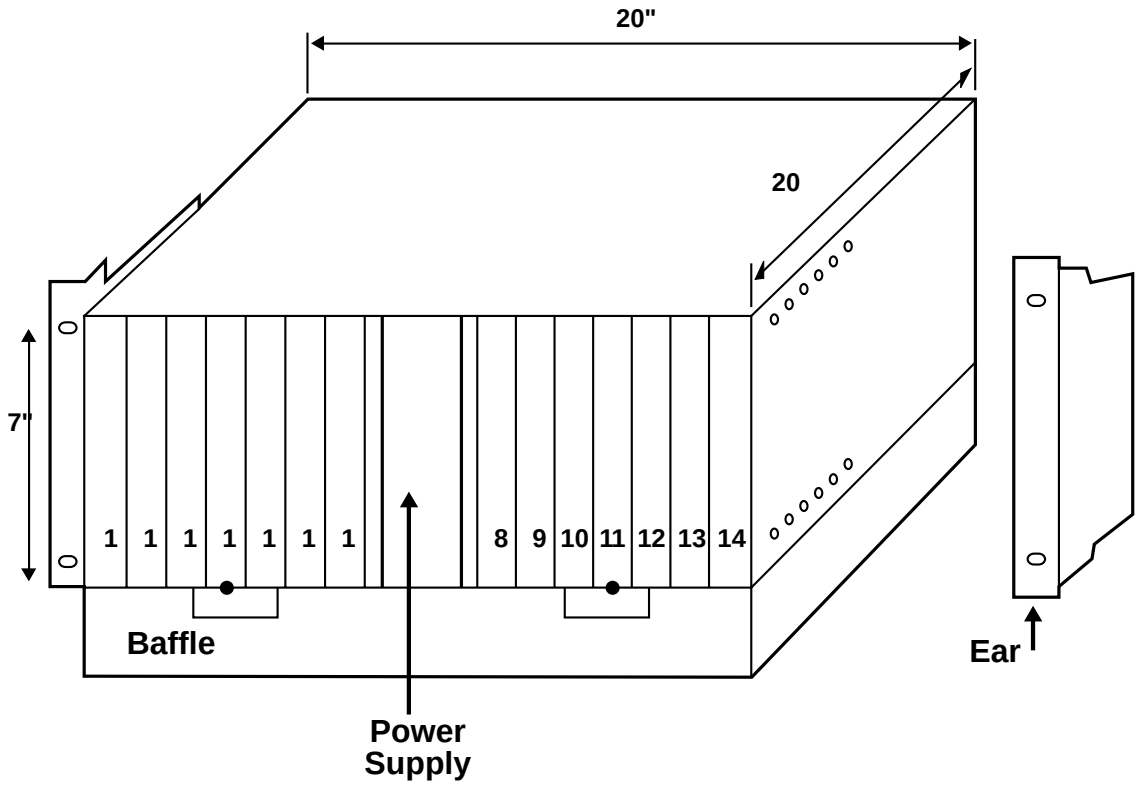


Fig. 5-1. The Standard Shelf.

Table 5-1. Standard Shelf Slot and Time Slot Positions (for voice only without an MCC card).

	Shelf slot position												
	EAST T1							WEST T1					
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	5	9	13	17	21	*	*	1	5	9	13	17	21
2	6	10	14	18	22	*	*	2	6	10	14	18	22
3	7	11	15	19	23	*	*	3	7	11	15	19	23
4	8	12	16	20	24	*	*	4	8	12	16	20	24

*=slots for T1 logic card referenced to a hard-wired (dumb) mode

Each slot position houses a front and a rear set of plug-in cards. The front card houses the functional logic, and the rear plug-in provides the interface logic and connectors.

NOTE

Table 5-1 displays all possible channel locations. For an actual installation, only the East or the West channels would be used.

Through changing a header strap, the shelf may be configured as shelf 1 (first 14 slots). See **Fig. 5-13**. When the Channel Bank does not come equipped with an MCC, the slot positions have the default function, and the cards must be configured for hard-wired mode as explained in **Chapter 5**. See **Table 5-1**.

5.2 Shelf Accessories

Rackmounting Brackets

You will find brackets included with the shelf to support two types of rackmounting.

1. Install the mounting brackets on the shelf using the screws provided. You can orient the brackets for a front mount or a mid-unit mount. Notice the Telco holes in **Fig. 5-4** and **5-5** for positioning the equipment on the racks.
2. Attach the heat baffle to the bottom of the shelf. See **Fig. 5-3**. The shelf unit comes with a heat baffle accessory that you attach with four screws to the bottom of the shelf. The baffle is intended to act as an enclosure bottom for open rack configurations and a protection against heat rise. Metal plates are used to attach two chassis to form one unit. See **Fig. 5-2** for an example of a 14-slot chassis with baffle and utility shelf and a second 14-slot chassis with a baffle.

CAUTION

To properly assemble the system, you must follow the configuration shown in Fig. 5-2. This arrangement is for either a single shelf or a single shelf with utility shelf (for power redundancy). You must install the baffle to maintain UL® compliance.

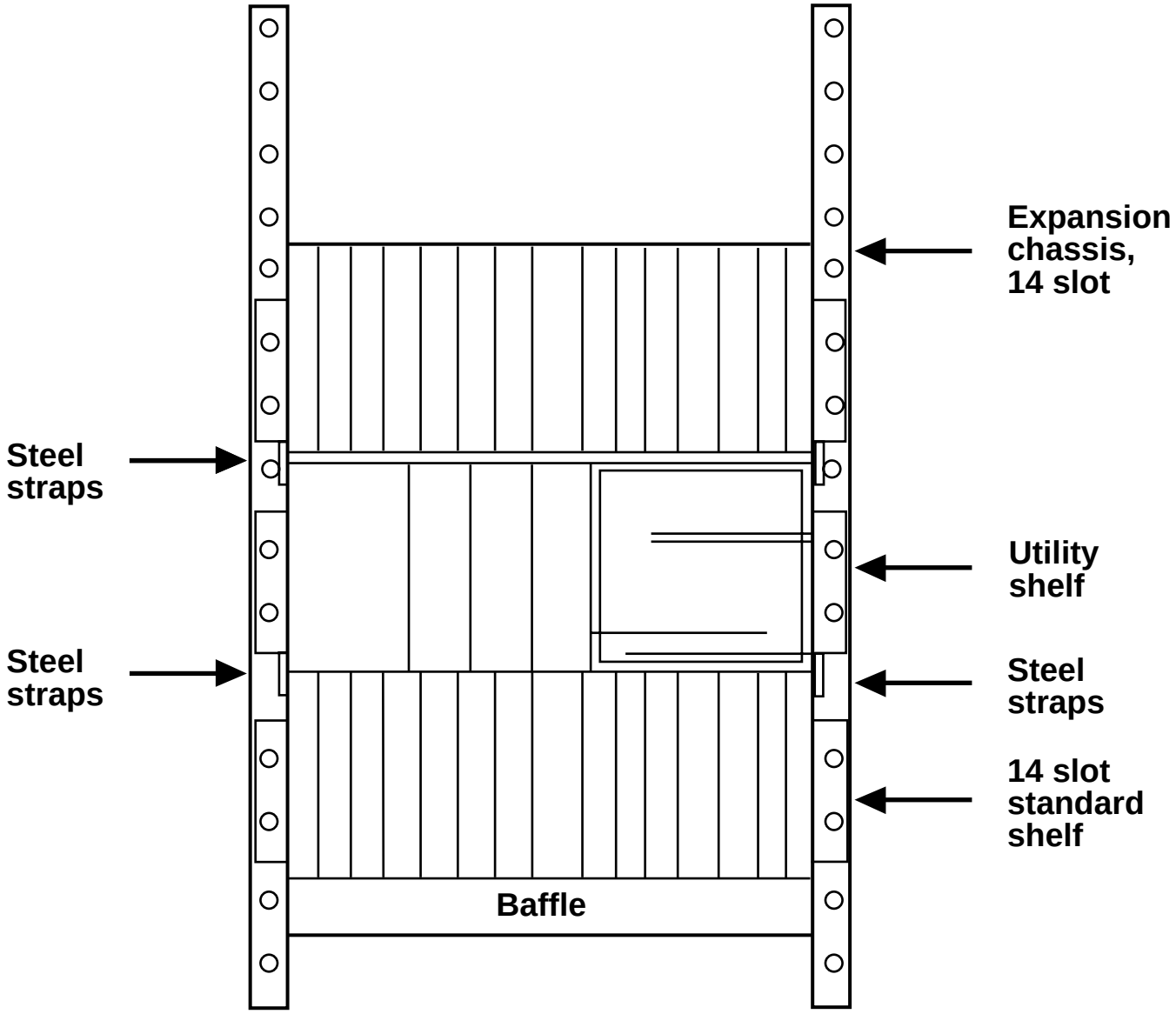


Fig. 5-2. Heat Baffle and Connecting Straps.

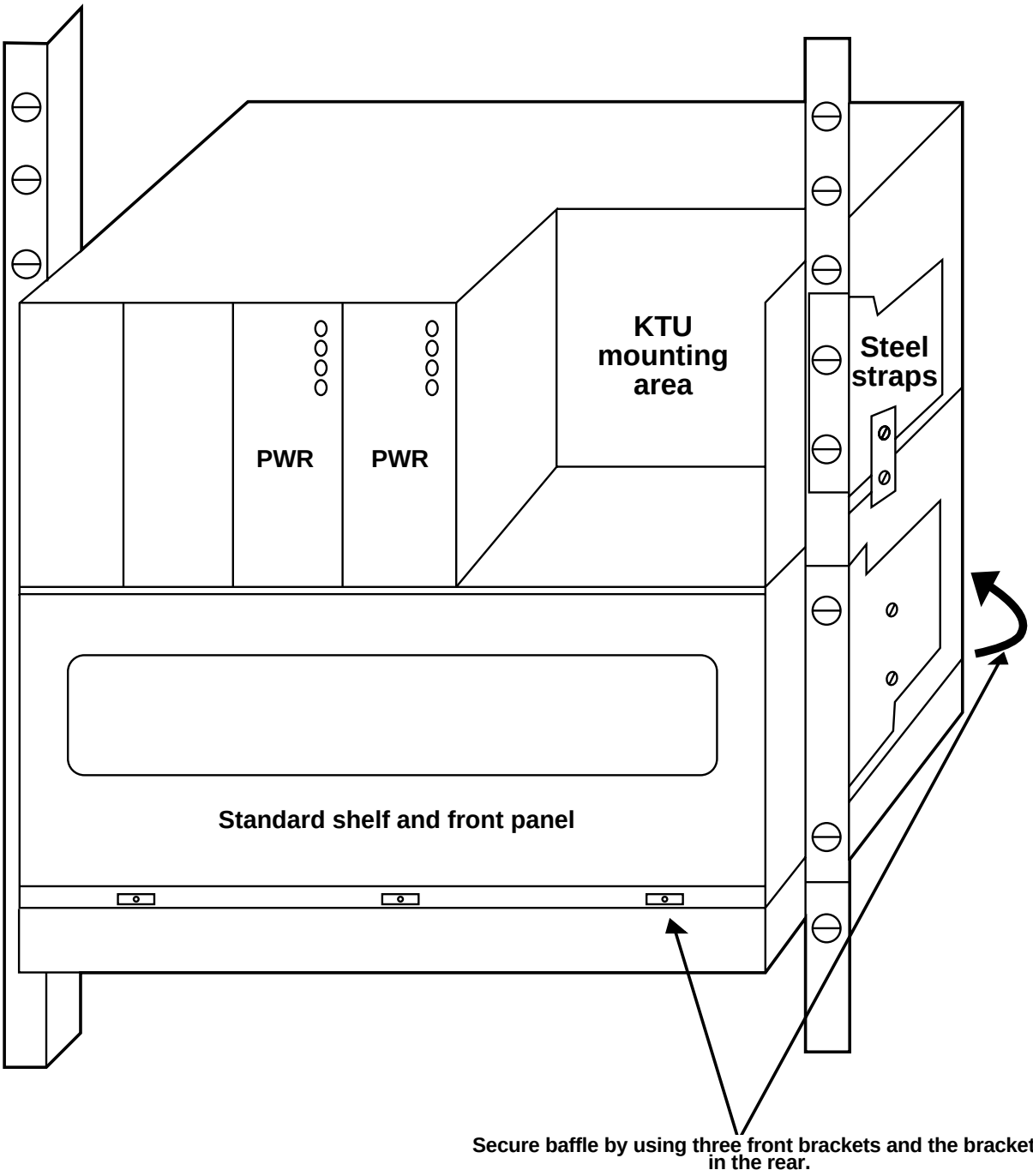


Fig. 5-3. Attaching Heat Baffle to Shelf Bottom.

Mounting the Chassis: Front Mount

3. Screw the unit into the front of the rack. If there is a large number of modules in the rack, the rack can get quite heavy, placing a large stress on the mounting ears. This is illustrated in **Fig. 5-4**. You may want to add rear support brackets to support the weight. You can buy the hardware with your cabinet.

Mounting the Chassis: The Mid-Unit Rack Mount

3. This mount gives the unit a better balance. It mounts the unit in the middle, hanging half over the rack. See **Fig. 5-5**.

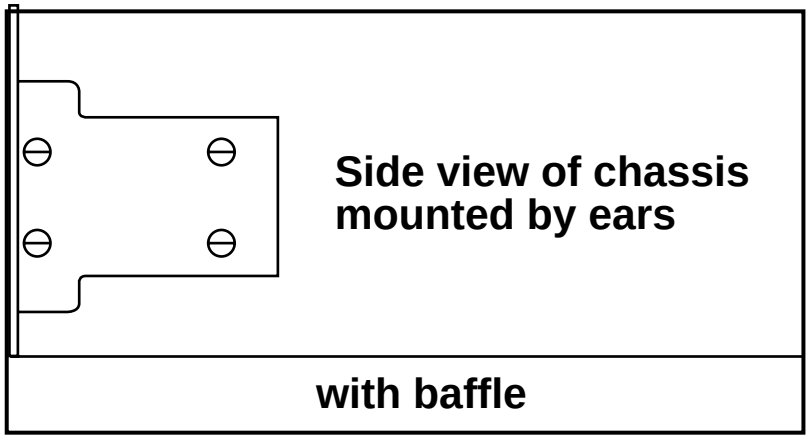


Fig. 5-4. Front Rack Mounting.

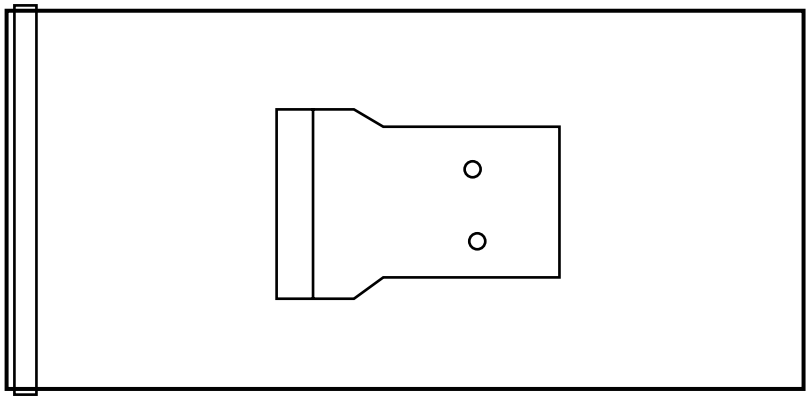


Fig. 5-5. Mid-unit Rack Mounting.

48V Power and Ring Generator(s)

4. Install the -48 VDC power and ring generator above the shelf in the KTU mounting space if you are using the utility shelf setup as shown in **Figures 5-6** and **5-7**. If you do not have a utility shelf, install it directly above the multiplexer chassis as shown in **Figures 5-8** and **5-9**.

WARNING

When working around the ringing generator as well as all voice cards, care should be taken because of AC ring voltage at 20 Hz.

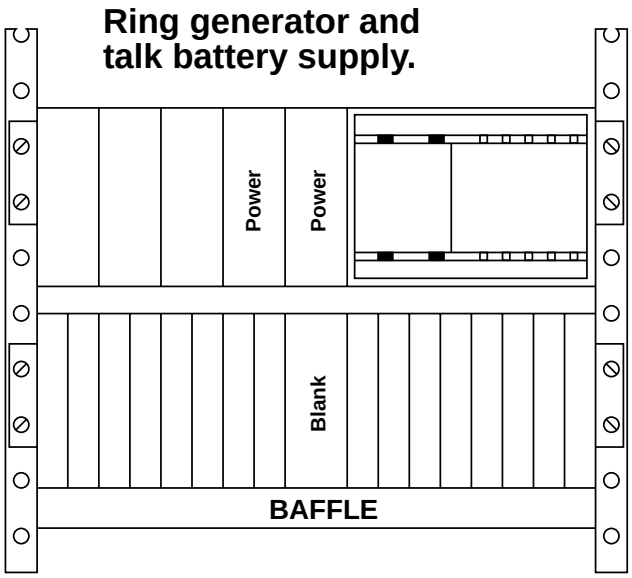


Fig. 5-6. Installing -48V power and ring generator in KTU mounting space.

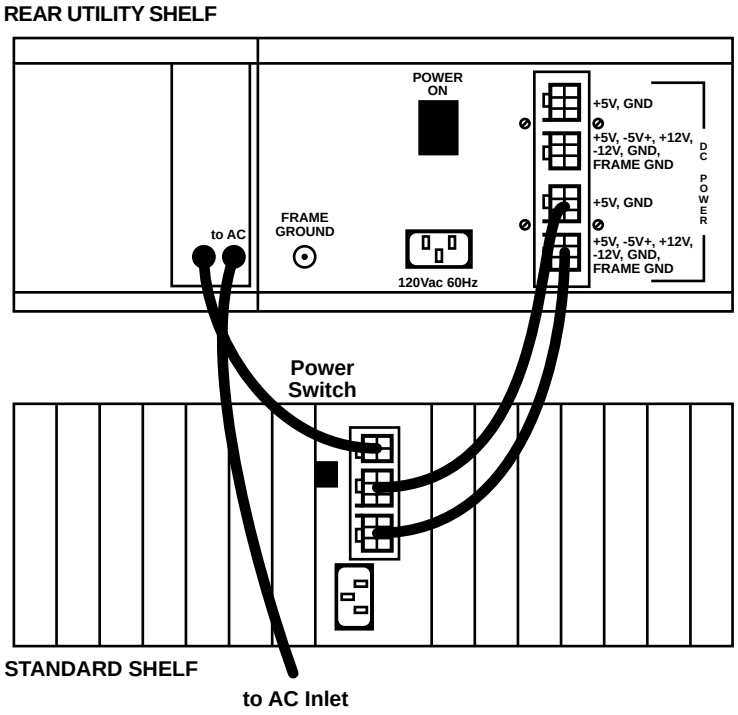


Fig. 5-7. Installing -48V power and ring generator. Use this mounting plan if you have a utility shelf.

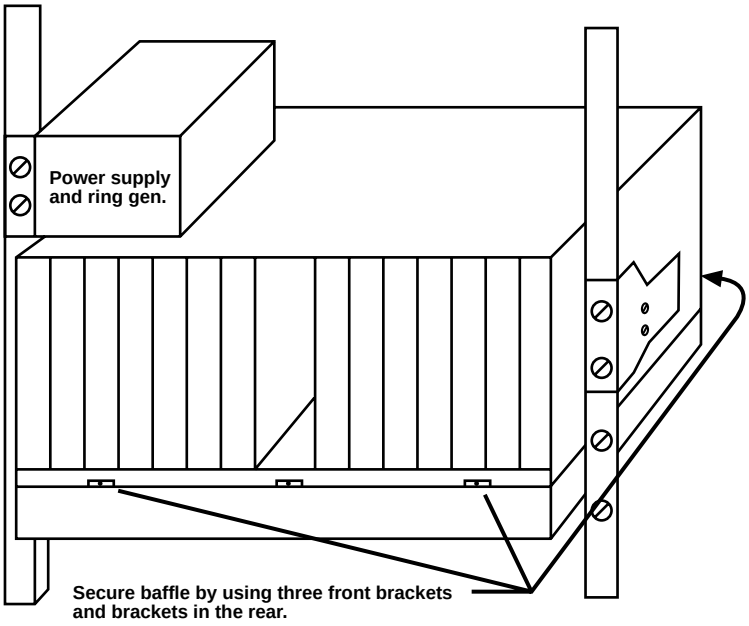


Fig. 5-8. Installing -48V power and ring generator. Use this mounting if you do not have a utility shelf.

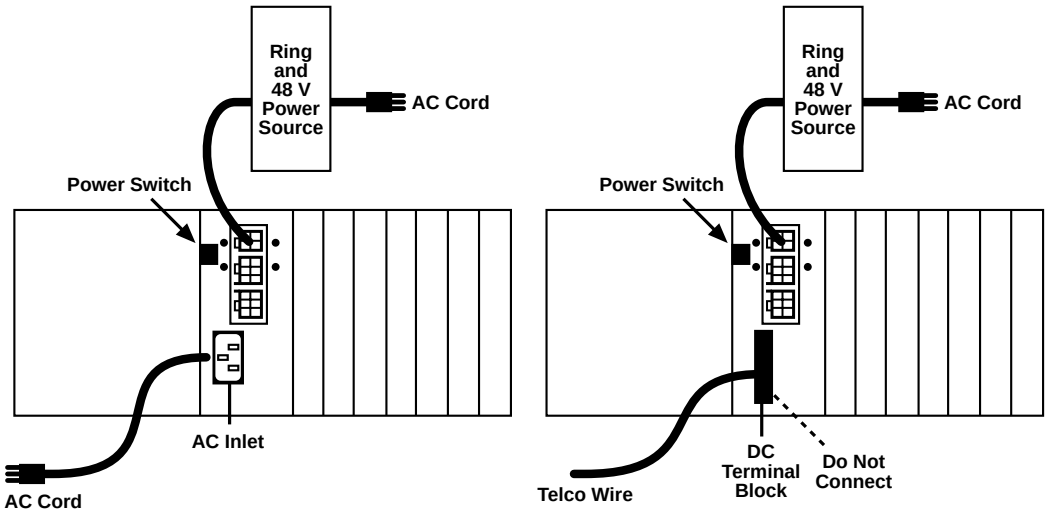


Fig. 5-9. Installing -48V and ring generator with no utility shelf layout (rear view).

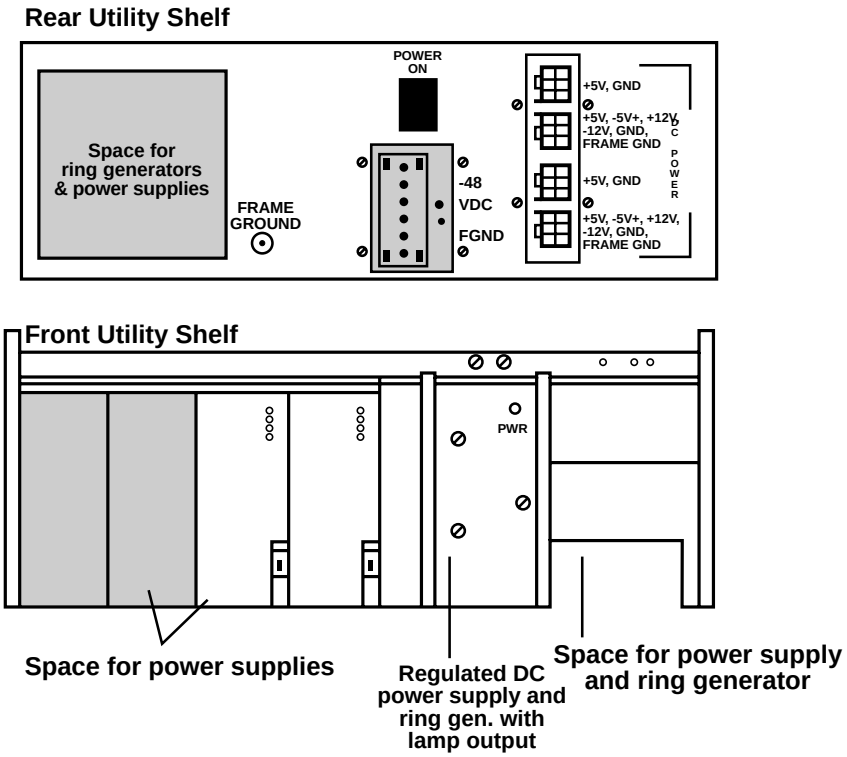


Fig. 5-10. DC Utility Shelf Layout.

5.3 Shelf Block Diagram

Figure 5-11 is a block diagram illustrating the architecture of the standard/split shelf and utility shelf. This diagram illustrates three types of busses:

- Rear access only (only accessible to rear plug-ins)
- Front and rear access (accessible to both plug-ins)
- Front to rear links (providing connectivity between a front plug and rear plug)

Basic Types of Bus Links:

Rear Access Only

- RNG/Bat voltage bus—This set of bus links provides connectivity of telephone signaling voltages and grounds to the rear voice-card sets.

Front Access

- The internal T1 bus(es) (East and West) provides the (traffic) paths for the voice and data signals between a T1 logic card and associated channel cards.
- The MCC bus is a shelf communication link that enables the monitor control and configuration (MCC) system to communicate with all plug-in cards.
- The system clock bus provides synchronous timing signals called the system clock to all logic cards. The East (T1) card set (primary or standby) feeds the system clock. The East card can be configured to synchronize this system clock to internal or receive timing signals.

Front and Rear Access

- The power bus provides 5V and 12V and power grounds to all plug-in cards.
- The signaling bus provides a path between the T1 logic cards and the plug-in channel cards for the signaling A, B, C, and D bits as defined in the AT&T standards.

Front-to-Rear Links

The front-to-rear links provide the interconnections between a front plug-in card and a rear plug-in card. Each slot position has its own set of links. These buses are used for providing connectivity of channel signal paths, configuration control, and signaling selection.

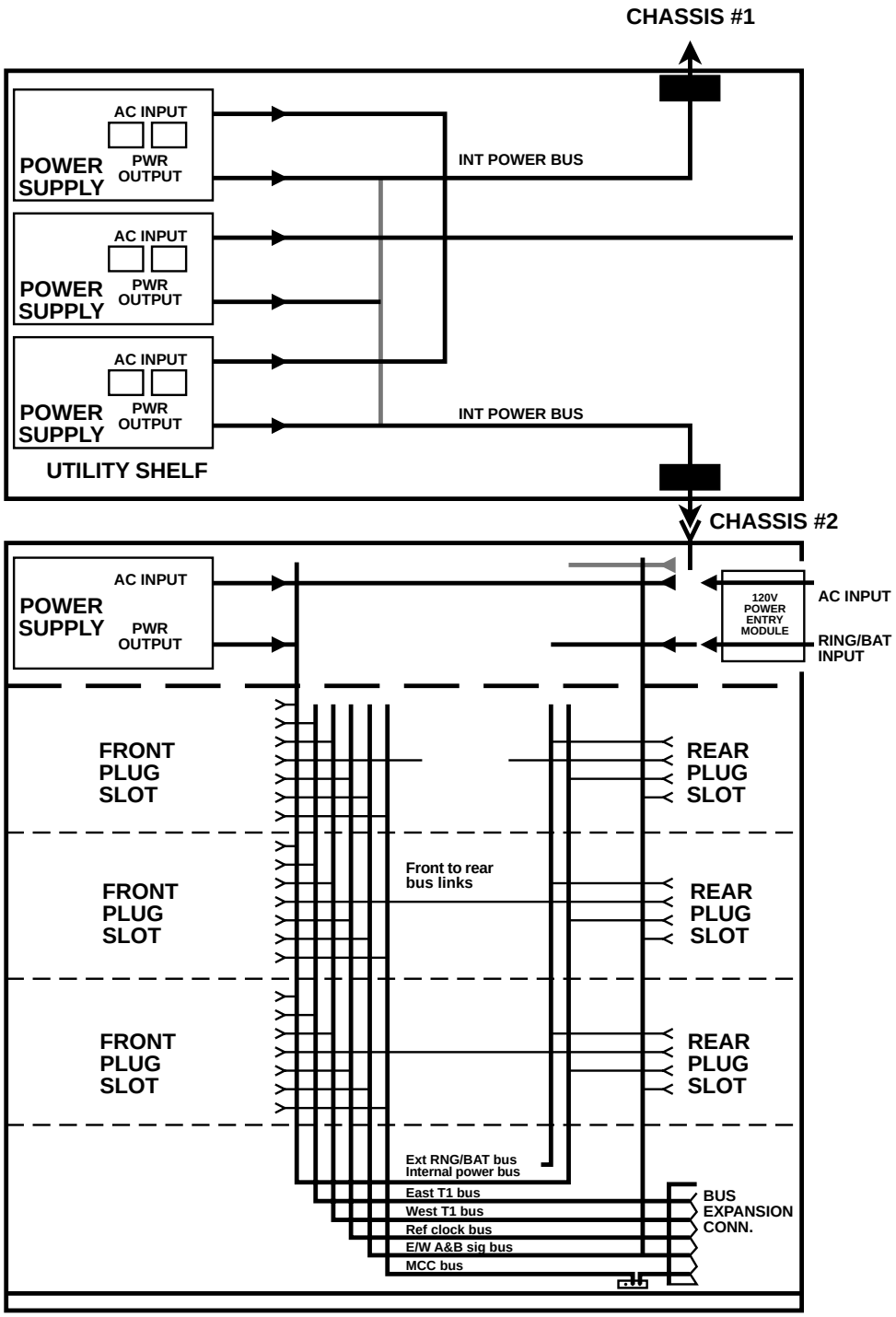


Fig. 5-11. Shelf Block Diagram.

6. Hardware Configuration

This chapter provides reference information primarily intended for technical support personnel to show locations of the jumper headers and switch selections.

6.1 AC Power Supply

The AC power supply card set consists of the front plug power supply assembly and the rear plug power entry module. Block diagrams of the assemblies are illustrated in **Figures 6-1** through **6-4** respectively.

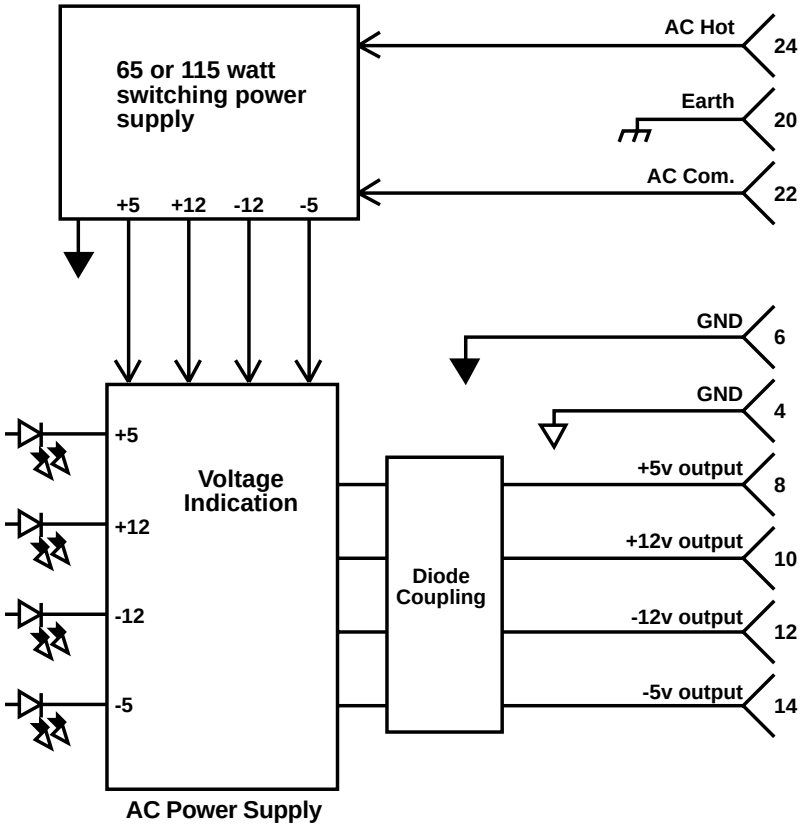


Fig. 6-1. Block Diagram for the Front Plug Power Supply.

Front Plug Assembly

The front plug assembly is either a 65 watt or 115 watt switching power supply that will operate from a nominal input voltage of 120 VAC or -48 VDC supplied through the rear plug assembly. The assembly provides internal V and 12V DC outputs to the chassis plug-in modules via the mid-plane PWR bus. Four green LEDS are located on the faceplate, one for each output. When an LED is "on," the corresponding output is in specification. See **Fig. 6-2** for assembly layout.

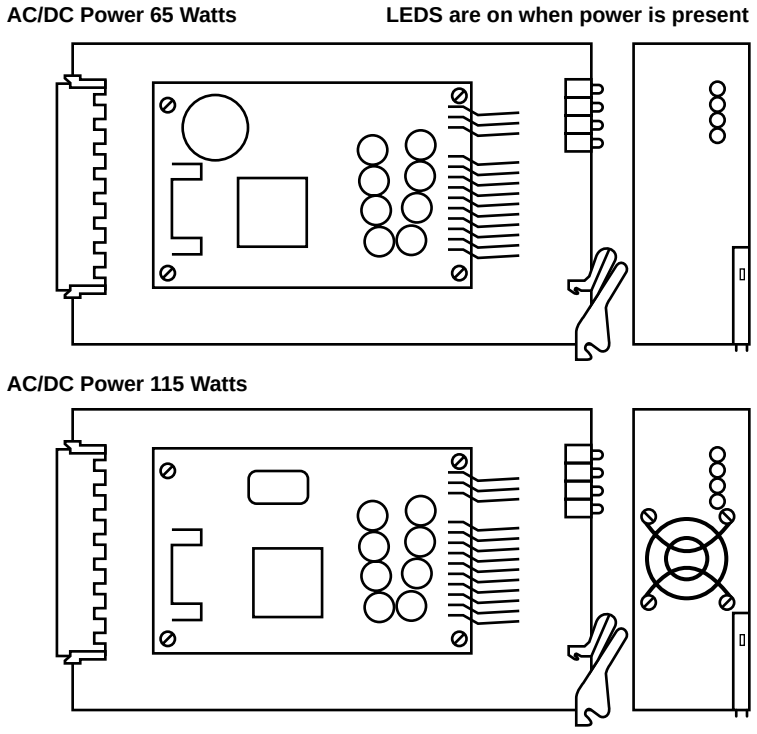


Fig. 6-2. AC and DC Power Supply Front Plug Assemblies.

You can plug the power supply set into the Channel Bank chassis or into the utility shelf. For example, the AC supply will be plugged into the standard 14 slot chassis for normal operation. For power redundancy, plug the AC supply into the utility shelf. For applications that have higher power requirements, use the larger power supply of 115 watts.

NOTE

If a DC power module is installed in the front, then a rear DC module is required. AC and DC power supplies CANNOT be mixed in the same utility shelf.

6.2 AC Rear Plug Power Entry Module

See **Fig. 6-3** for the assembly layout and **Fig. 6-4** for the ground plan.

The rear entry module provides the interface connections for 120 VAC, ring generator, -48 V telephone signaling battery connections, and utility power. The 120 VAC connector is a standard IEC power-line connector on/off switch. The ring and -48 V connector is a 4-connector male plug. The utility shelf connector is a 6-position female connector. The -48 V, ring and ground connections are inputs to the shelf. These signals are then available on the backplane for rear plug-in cards.

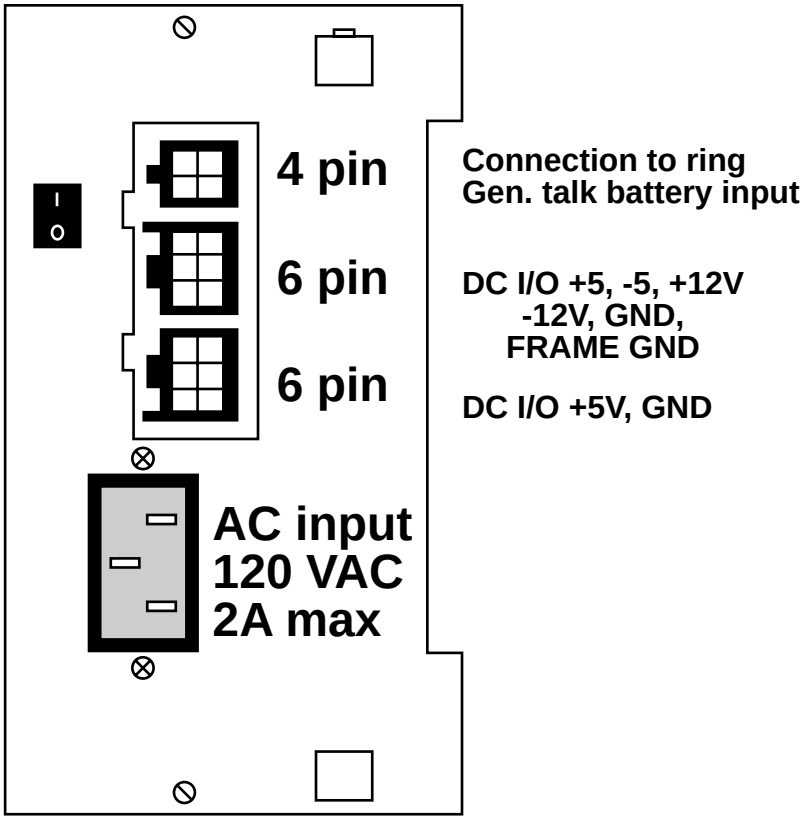


Fig. 6-3. AC Power Supply Rear Plug Assembly.

There are no header or option selections to configure on this card set, and there are no field-replaceable fuses.

There is an AC fuse on the power supply: 2 A, 250 V, AGC.

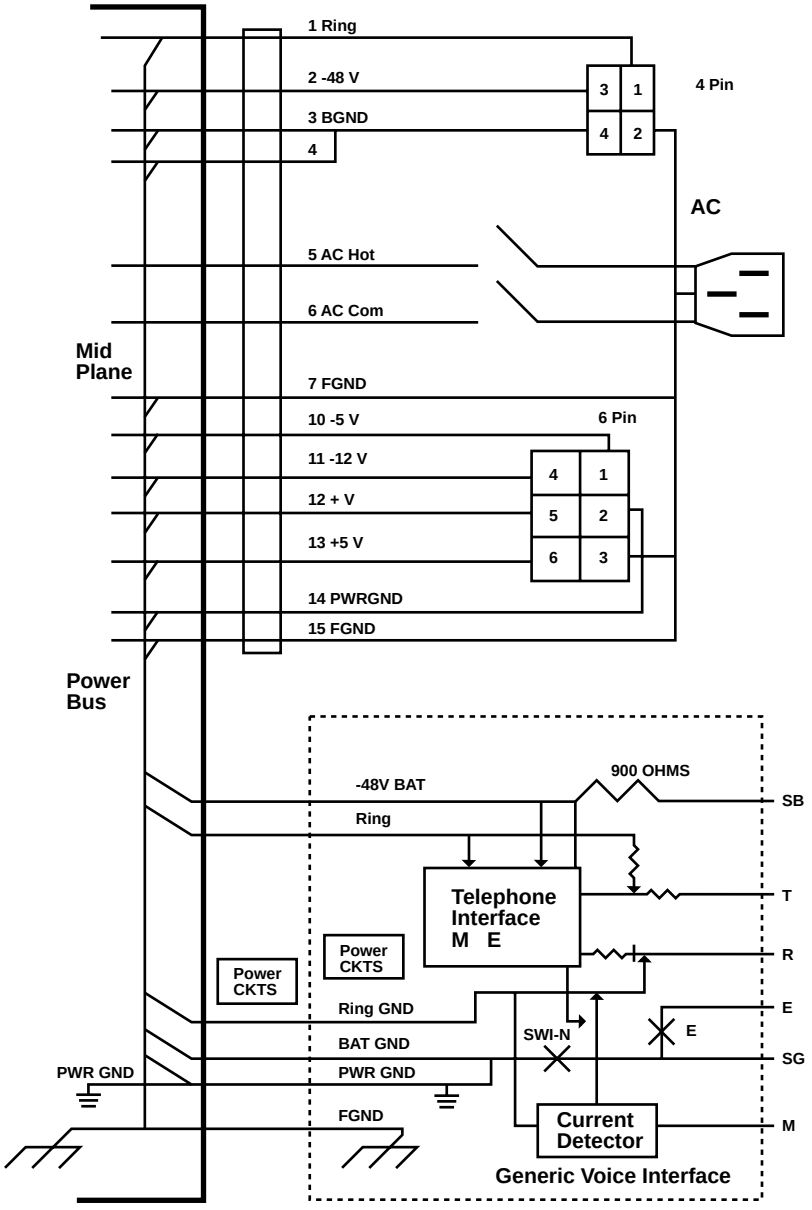


Fig. 6-4. Ground Plan for the Rear-Plug Power-Entry Module.

6.3 DC Rear Plug Power Entry Module

See **Fig. 6-5** for the assembly layout and **Fig. 6-4** for the ground plan.

The rear entry module provides the interface connections for an input ring generator, -48V telephone signaling battery connections, and utility power. The DC input terminal block connector is a standard IEC power line connector. The ring and -48V connector is a 4-connector male plug. The utility shelf connector is a 6-position female connector. The -48V DC and ground connection is an input to the shelf.

There are no header or option selections.

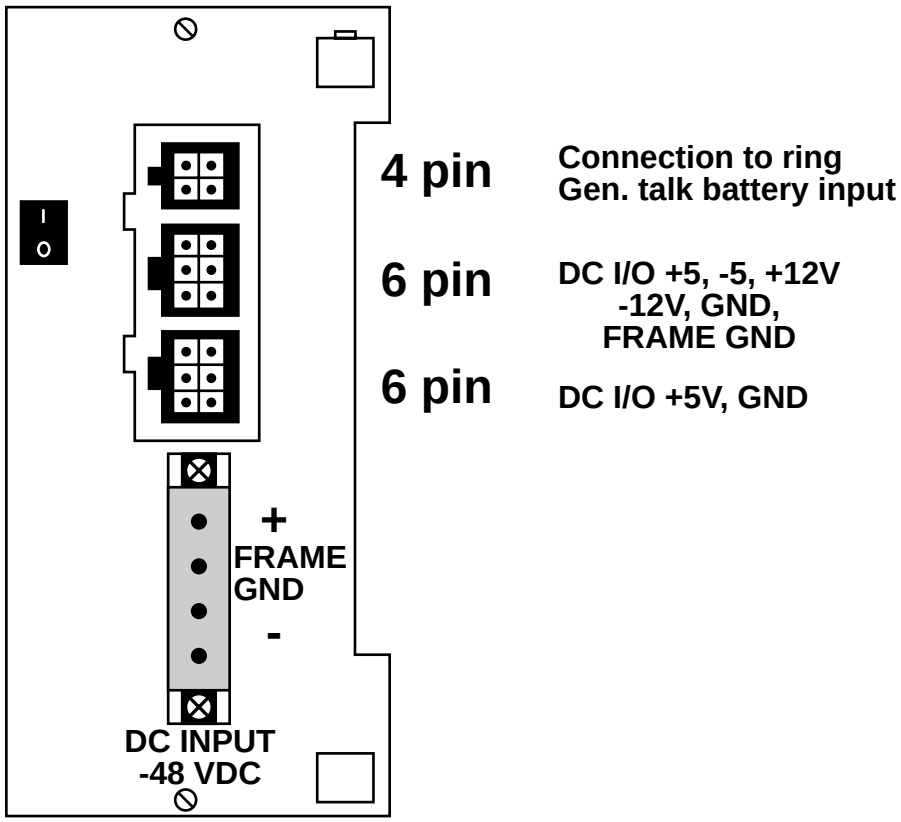


Fig. 6-5. DC Power Supply Rear Plug Assembly.

6.4 T1 Logic Card (MT440C)

The T1 logic card performs the T1 multiplex/de-multiplex functions, converting the T1 signals to T1 internal bus signals. Individual channel cards or a second T1 common logic card can insert traffic into DS0 slots and read traffic from DS0 slots. **Fig. 6-6** is a block diagram of the T1 logic card.

The MCC uses the MCC communication bus to provide configuration data to the T1 logic card.

The T1 front-plug controller:

- Performs configuration selections
- Controls LEDs
- Reads front-panel switches
- Reads performance data

The rear plug assembly DSX-1 interfaces to a CSU (using an internal CSU) or to the line directly. On the receive side, the rear plug extracts data and clock signals from the T1 line card and passes them to the front logic card for demultiplexing. On the transmit side, multiplexed data is framed and coded and passed to the rear plug. Then the line is coded into a DSX-1 pulse-shaping signal.

T1 Front Plug Assembly LEDs :

- Local Analog Loopback (LAL)
- On Line Status (ONL)
- Alarm (ALM)
- Red Alarm (RED)
- Yellow Alarm (YLW)
- Bipolar Violation (RBV)

Switches: LAL, ONL, ALM

Rear Plug Assembly (MT441C)

The rear-plug assembly is illustrated in **Fig. 6-9.** This assembly provides a DSX-1 interface. The transmit compensation level can be selected for different cable lengths.

The T1 rear plug also provides:

- DSX-1 interface (optional)
- Internal CSU (optional)
- Control for redundant T1s
- Test-monitor jacks

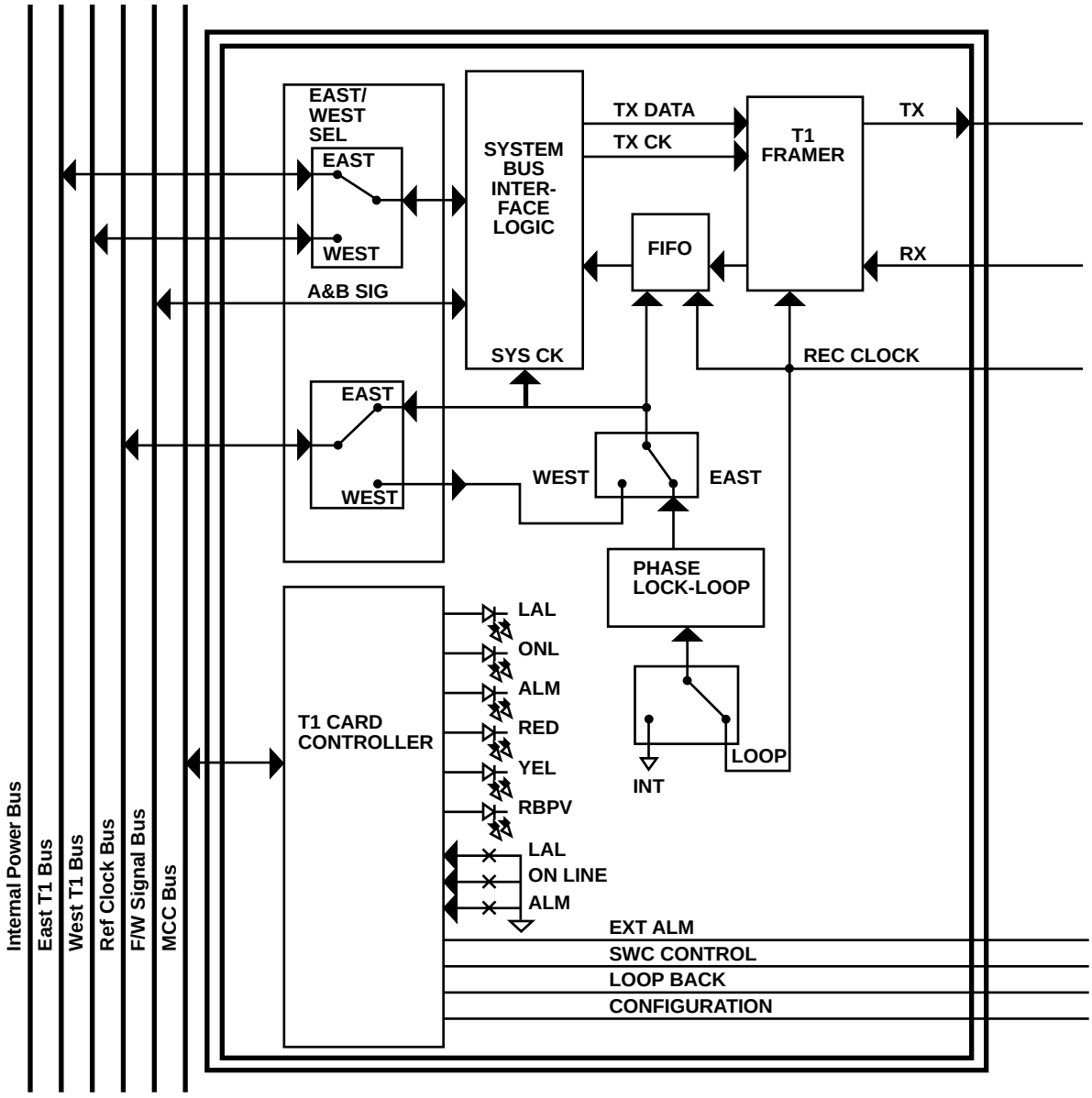


Fig. 6-6. Block Diagram for the T1 Logic Card.

There are no field-replaceable fuses on this card. Verify header and switch selections.

See **Fig. 6-7** and the following header information:

HD3 - Smart/dumb mode

1-2 Smart (factory)
2-3 Dumb

NOTE

The T1 ignores the loopback mode in alarm state. The T1 sends out a blue alarm when the unit is in loopback mode.

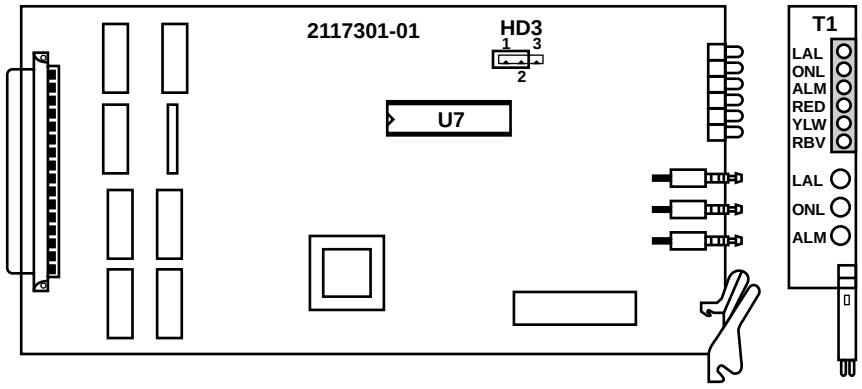


Fig. 6-7. T1 Logic Card Front Plug Assembly.

6.5 T1 Logic Card Switches

LAL: Depressing this switch puts the unit into local loopback or takes the unit out of loopback. The LAL indicates the unit's state.

ONL: Depressing this switch puts the unit on-line or off-line. The ONL LED indicates the unit's state. Use caution when you are in the redundant mode. The T1 should be forced on-line through the NMS and not by using the on-line switch.

ALM: (Currently not used.)

6.6 DSX-1 Rear Plug Assembly

Fig. 6-8 is a block diagram for the rear plug assembly.

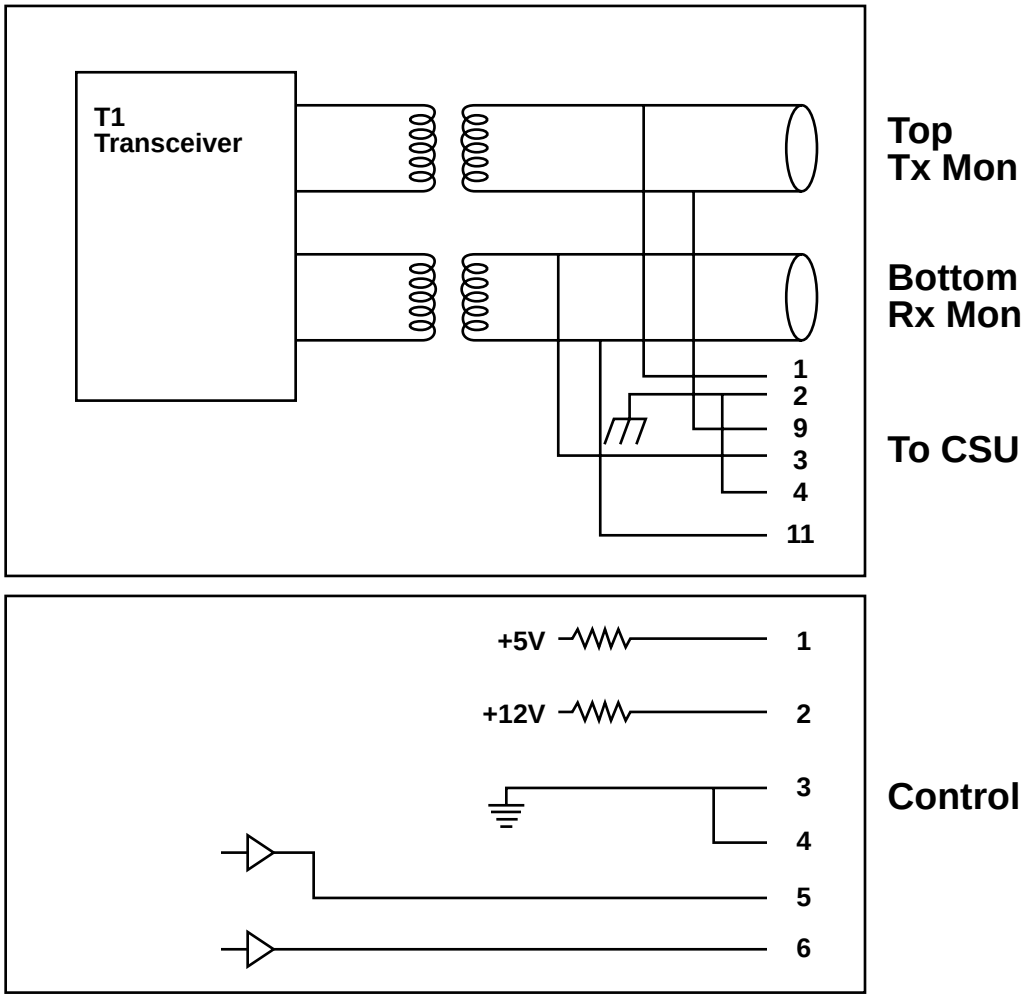


Fig. 6-8. Block Diagram for the DSX-1 Rear Plug Assembly.

DSX-1 Rear Plug Assembly Connectors

CSU Connector (15-pin D sub)

- DSX1 interface
- 1 and 9 TX, 3 and 11 RX

Monitor Jacks (Bantam)

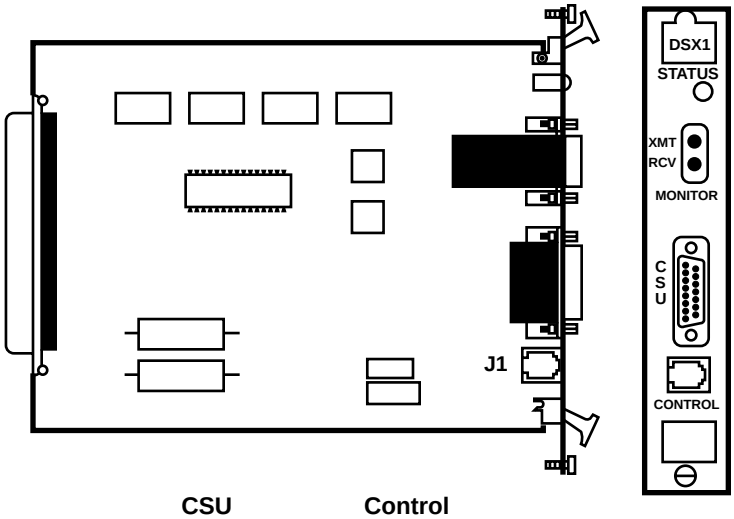
- XMT
- RCV

Control Connector (6 pin modular)

- Pin 1 is +5 VDC
- Pin 2 is +12 VDC
- Pins 3, 4 is ground
- Pins 5, 6 is switch control

There are no field-replaceable fuses on this card. See **Fig. 6-9**.

There are no header or switch selections.



CSU

Pin	Name	Direction
1	TX T1 T	Out A
2	NU	
3	RX T1 T	In A
4	NU	
5	NU	
6	NU	
7	NU	
8	NU	
9	TX R1 R	Out B
10	NU	
11	RX T1 R	In B
12	NU	
13	NU	
14	NU	
15	NU	

Control

Pins	
1	+5
2	+12
3	GND
4	GND
5	SWC
6	SWC

STATUS INDICATOR
ON - Compatible plug-in is inserted into front slot.

OFF - No front plug-in inserted into front slot.

BLINKING - Incompatible front plug-in is inserted into the front slot.

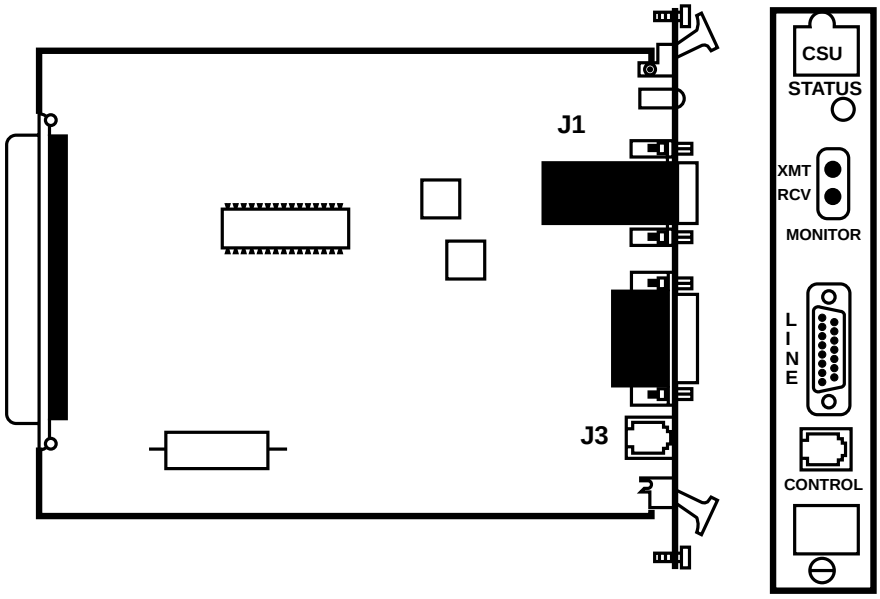
Fig. 6-9. DSX1 Rear Plug Assembly.

6.7 CSU (MT465C)

See **Fig. 6-10** for a layout of the CSU card.

There are no field-replaceable fuses on this card.

There are no header, jumper, or switch selections.



STATUS INDICATOR

ON - Compatible plug-in is inserted into front slot.

OFF - No front plug-in inserted into front slot.

BLINKING - Incompatible front plug-in is inserted into the front slot.

Fig. 6-10. CSU Rear Plug Assembly.

6.8 Quad PCM Voice Front Plug Assembly (MT445C)

There are four voice-channel circuits on each card. You can activate each voice circuit and assign it to any of the 24 time slots. The front card contains four CODEC functions and interfaces with the rear card over the front-to-rear links. Different rear cards can be mated with one front card. The front card is illustrated in **Fig. 6-12**. The rear cards are:

- 4-wire E&M providing Type I, II, and III signaling
- 2-wire station end: loop start or ground start, FXS, PLAR
- 2-wire office end: loop or ground start, FXO
- 4-wire analog data

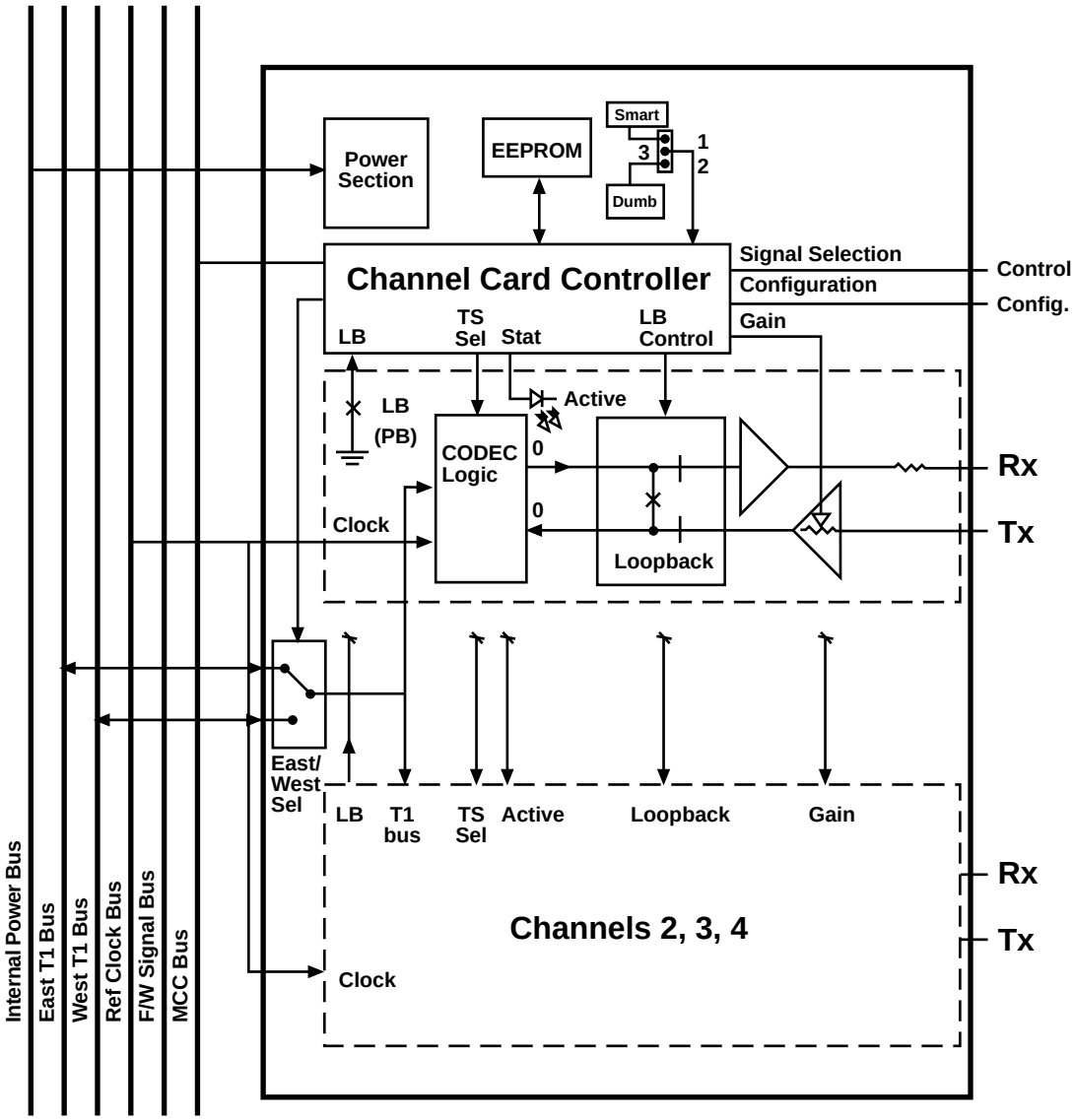


Fig. 6-11. Block Diagram for the Quad PCM Front Plug Assembly.

The quad voice channel front plug assembly includes the following:

- 4 LEDs
- 4 Switches
- Loopback (1/ckt)
- Status (1/ckt)

- Active (on steady)

- Blinking (test mode)

- Off (T1 link down or not configured)

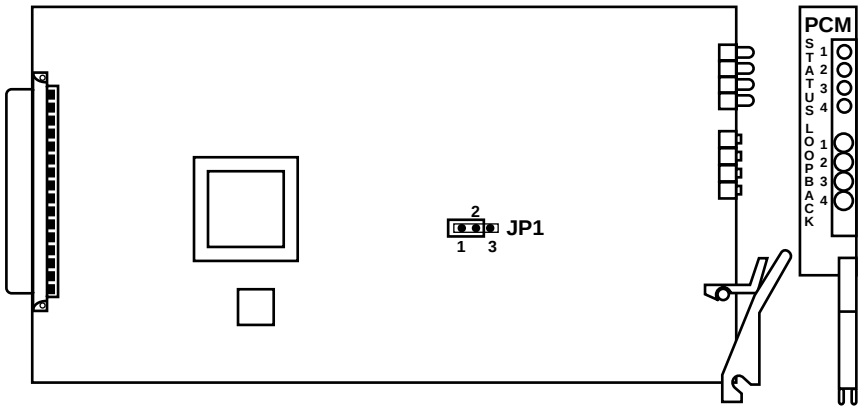
There are no field-replaceable fuses on this card.

Verify header and switch selections.

JP1:

1-2 Smart Mode (MCC controlled)

2-3 Dumb Mode



SMART/DUMB SELECTION

1 2 3 **Smart**

1 2 3 **Dumb**

LED STATUS INDICATORS

• ON - Channel not assigned to DSO or in alarm.

• BLINKING - Channel in loopback

LOOPBACK SWITCHES

• Activate channel loopback by depressing switch until status LED starts to blink.

• Deactivate channel loopback by depressing switch until status LED stops blinking.

• Disable during alarm condition.

Fig. 6-12. Quad PCM Voice Front Plug Assembly.

6.9 Quad 4-Wire E&M Rear Plug Assembly (MT446C)

See **Fig. 6-13** for the block diagram.

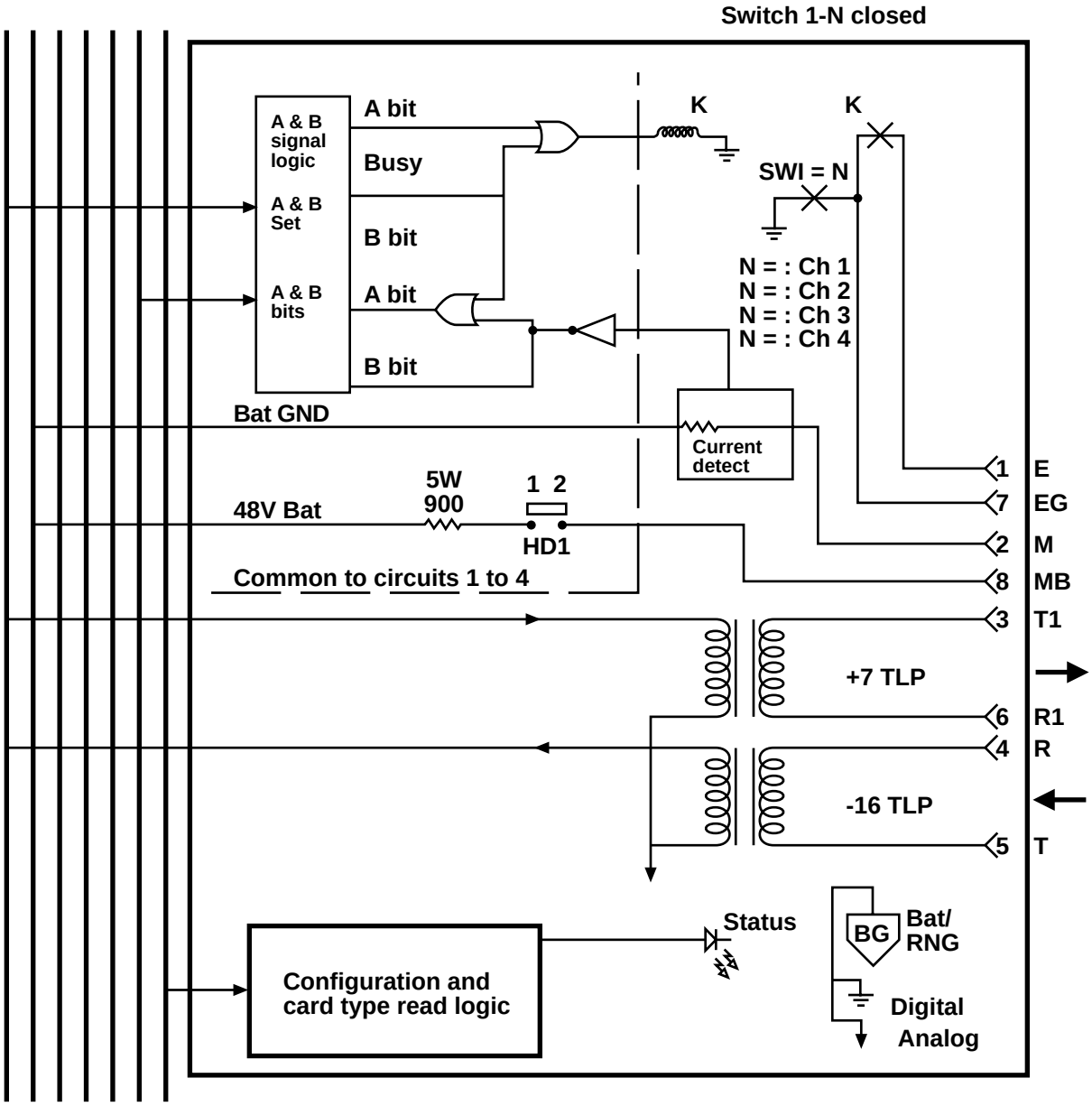


Fig. 6-13. Block Diagram for the 4-Wire E&M Rear Plug Assembly.

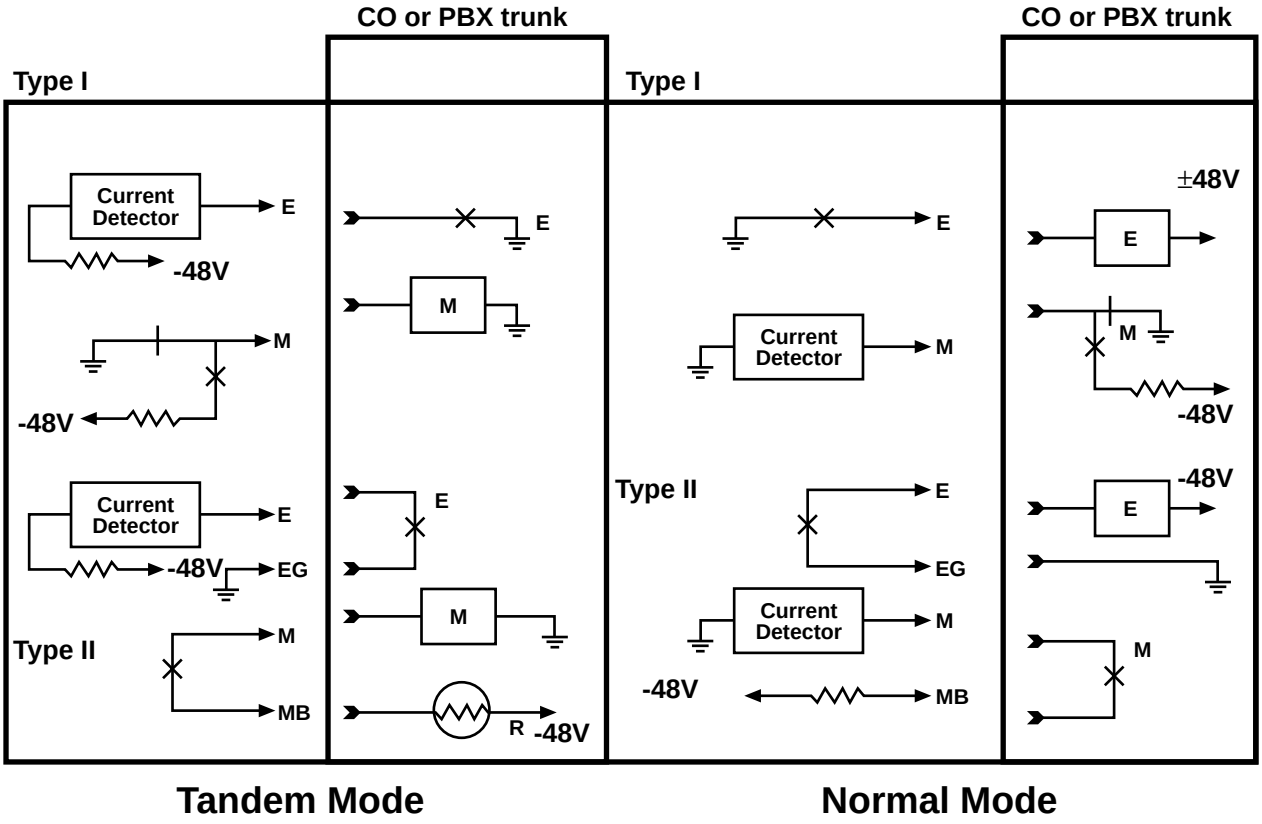


Fig. 6-14. Normal and Tandem E&M Signaling Configurations.

E&M Signaling Configurations

Table 6-1. Signaling Configurations.

Mode	Type	Receive input	Transmit output
Normal	I	M at resistance battery	E at ground
Normal	I	M at ground/open	E is open
Normal	II	M/MB loop is closed	E/EG loop is closed
Normal	II	M/MB loop is open	E/EG loop is open
Tandem	I	E at ground	M at resistance battery
Tandem	I	E is open	M at ground
Tandem	II	E/EG loop is closed	M/MB loop is closed
Tandem	II	E/EG loop is open	M/MB loop is open

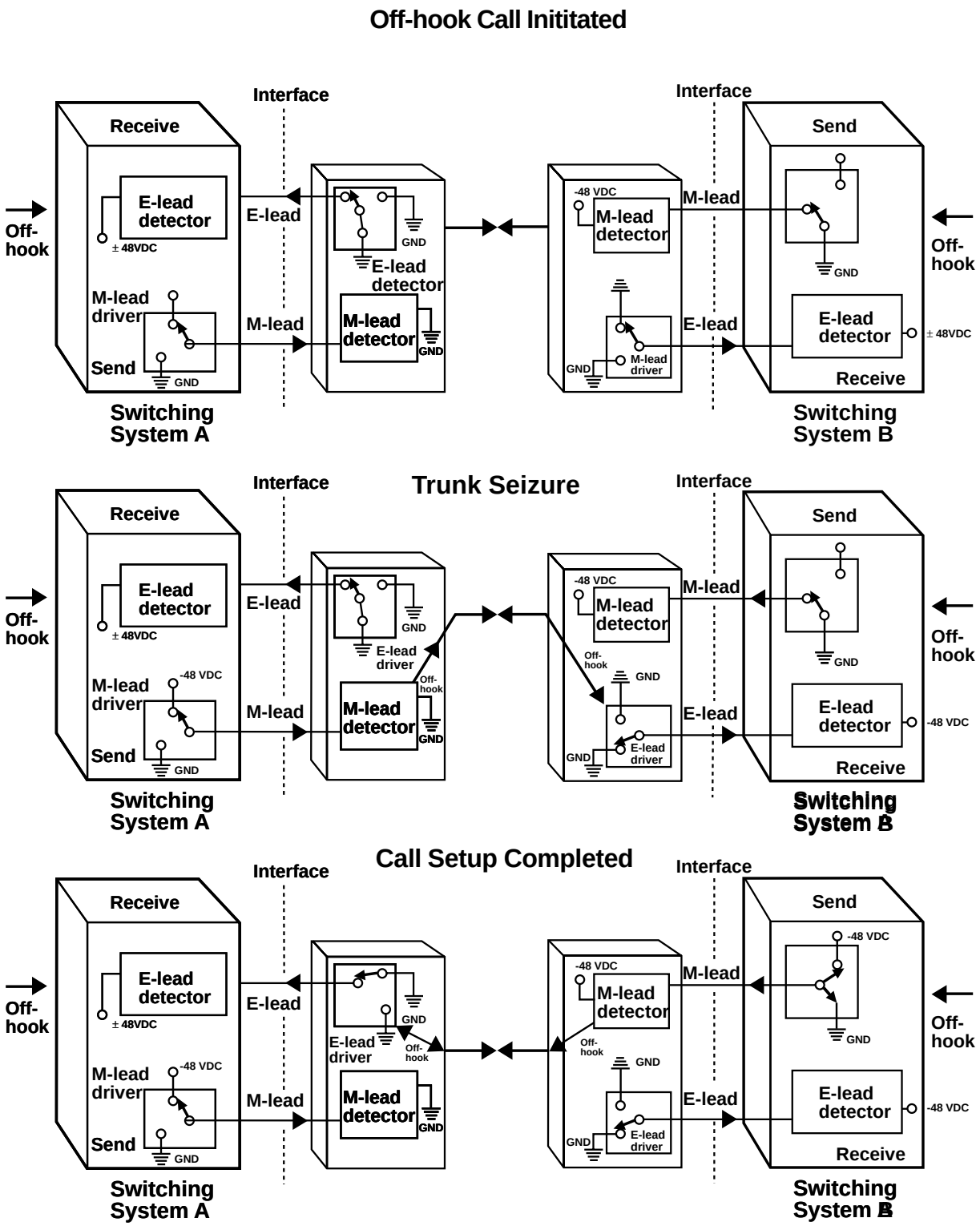


Fig. 6-15. Calling Sequence for E&M Type I.

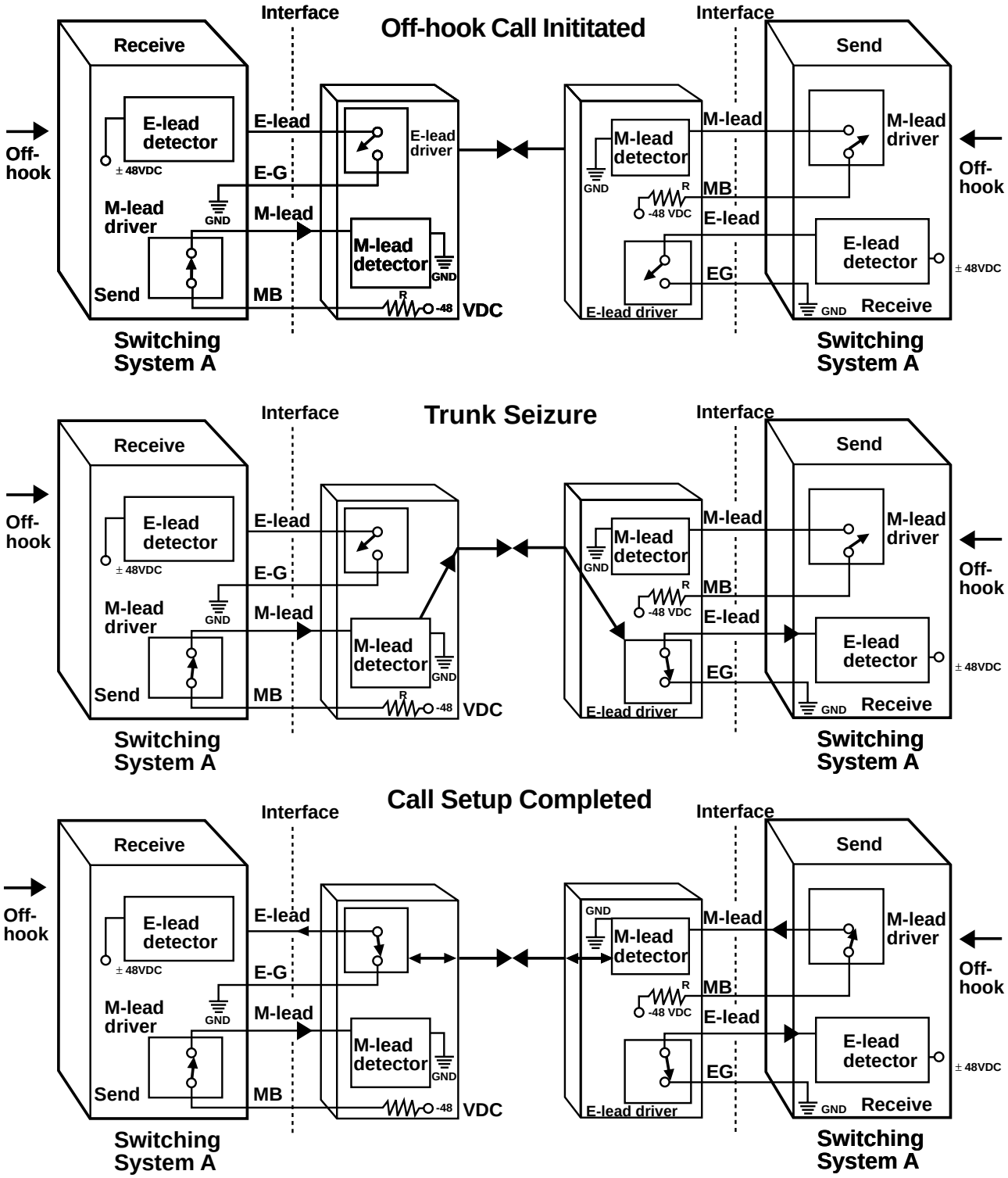


Fig. 6-16. Calling Sequence for E&M Type II.

Table 6-2. Circuit Signaling.

Trunk-to-signaling circuit				Signaling-to-trunk circuit		
Type	Lead	On-hook	Off-hook	Lead	On-hook	Off-hook
I	M	GND	BAT	E	Open	GND
II	M	Open	BAT	E	Open	GND
III	M	GND	BAT	E	Open	GND
IV	M	Open	GND	E	Open	GND

Table 6-3. Normal Mode E&M Signaling States.

E&M Input	Transmit A-bit	Transmit B-bit	Receive A-bit	Receive B-bit	E&M output
M-lead GND or open	0	0	*	*	
M-lead battery or loop**	*	1	*	*	
	*	*	0	*	E-Lead open
	*	*	1	*	E-lead GND or loop**

Table 6-4. Tandem Mode E&M Signaling States.

E&M Input to tandem	Transmit A-bit	Transmit B-bit	Receive A-bit	Receive B-bit	E&M output from tandem
E-lead open	0	0	*	*	
E-lead GND or loop**	1	1	*	*	
	*	*	0	*	M-lead GND or open
	*	*	1	*	M-lead battery or loop**

*Either 1 or 0
**Selectable option

Verify Header and Switch selections.

- SW1

• ON Type I & III signaling

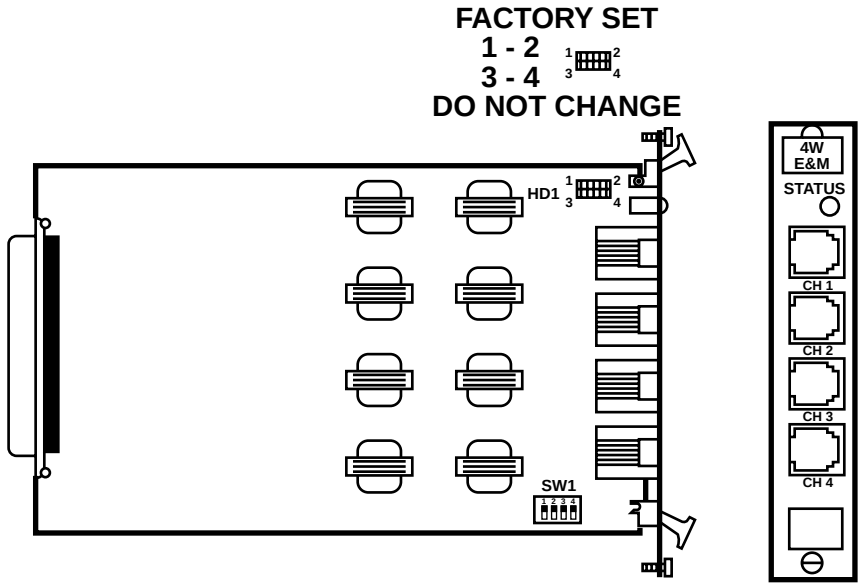
• OFF Type II signaling

- HD1 Factory Set

• 1-2, shorted. Do not change.

• 3-4, shorted

See **Fig. 6-17** for a description of the switches, jumpers, and the headers that you need to configure. See **Figures 6-18** through **6-20** for block diagrams for Types I, II and III signaling.



SWITCH SW1 SELECTION

ON - GND on pin 7 (SG) for Type I and III signaling.

OFF - Form a contact between pins 1 (E) and 7 (SG) for Type II signaling.

Positions:
1 - CKT #1
2 - CKT #2
3 - CKT #3
4 - CKT #4

STATUS INDICATOR

ON - Compatible plug-in is inserted into front slot.

OFF - No front plug-in.

BLINKING - Non-compatible plug-in is inserted into front slot.

Fig. 6-17. Quad 4-Wire E&M Rear Plug Assenbly.

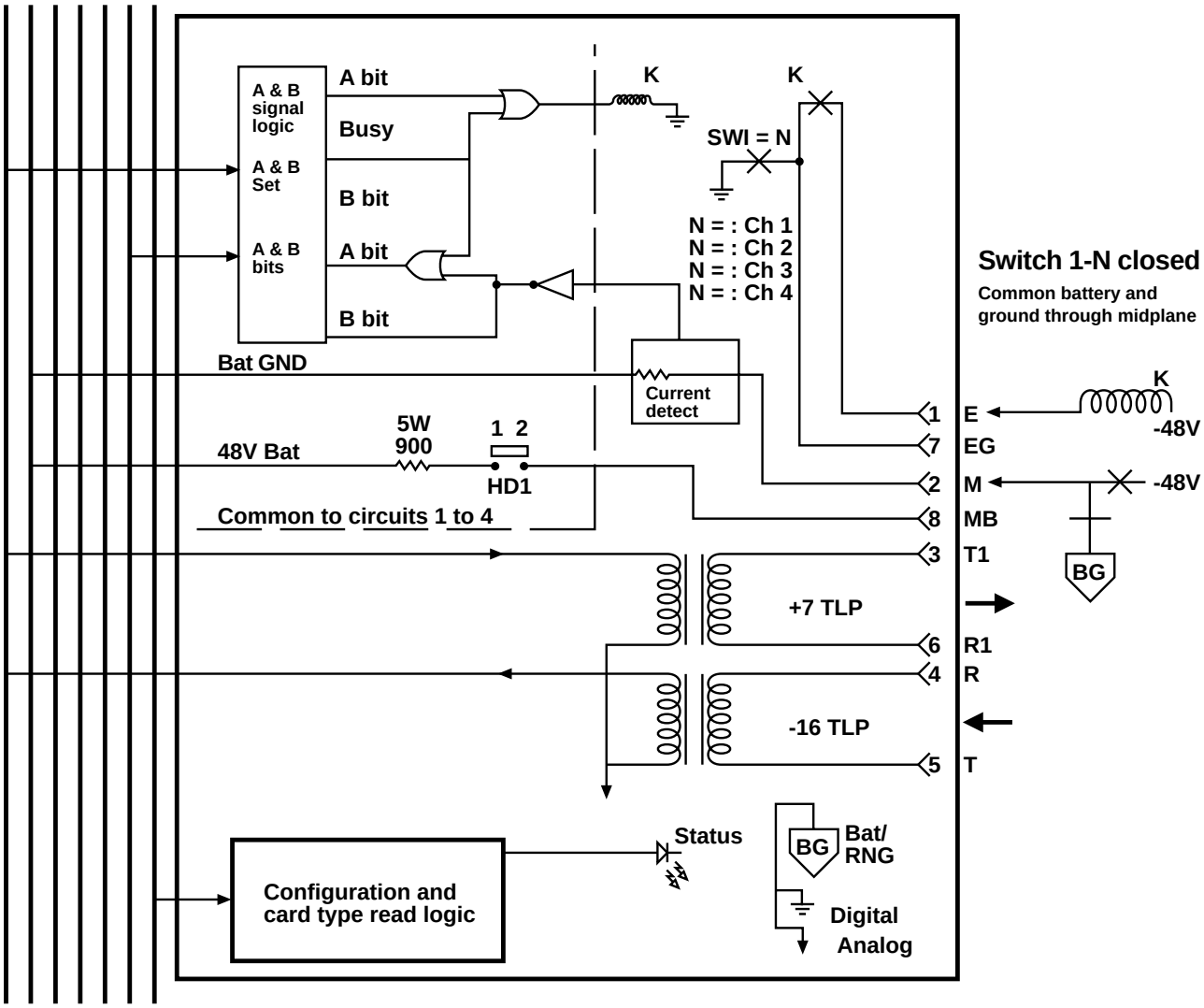


Fig. 6-18. Type I Signaling.

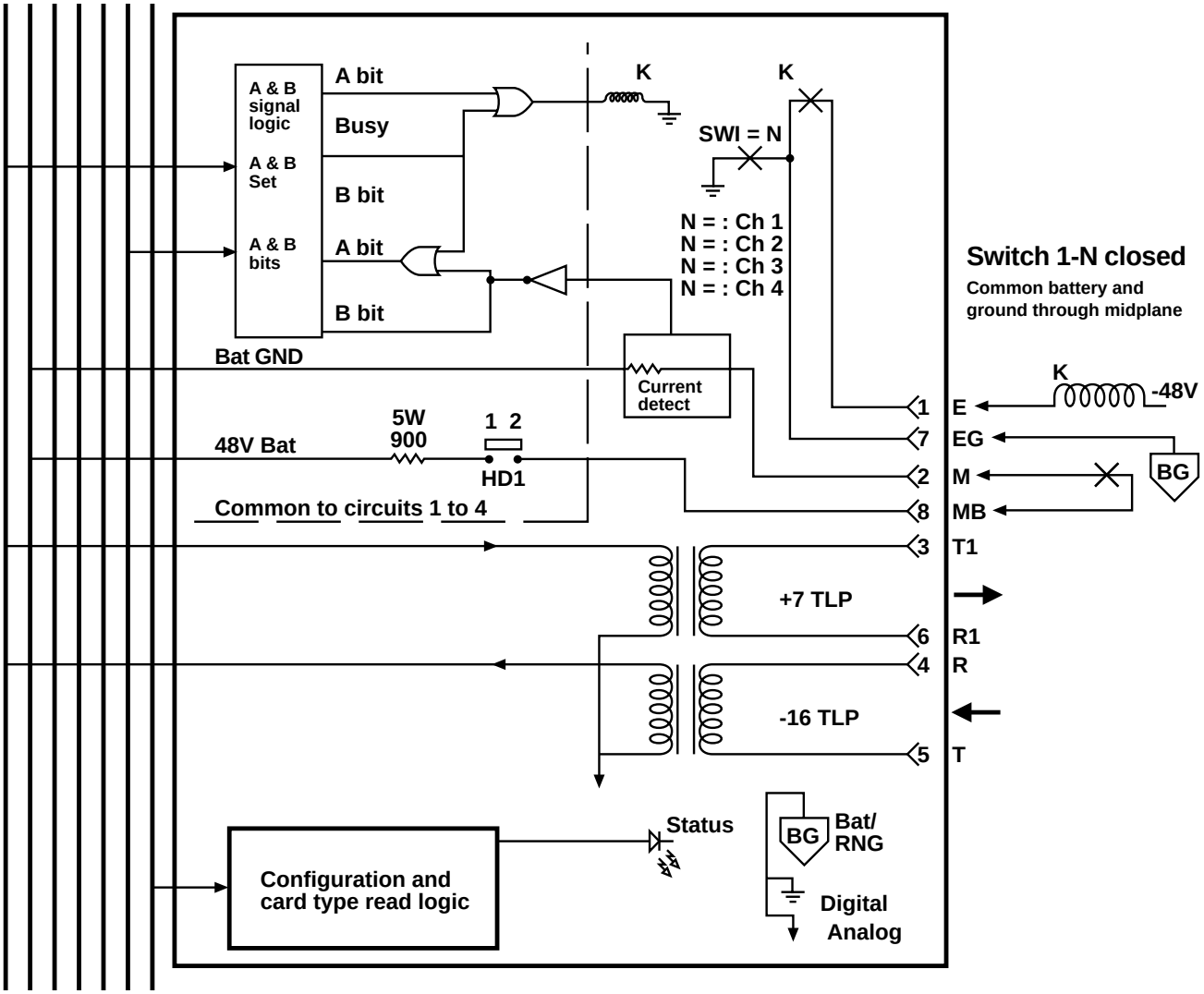


Fig. 6-19. Type II Signaling.

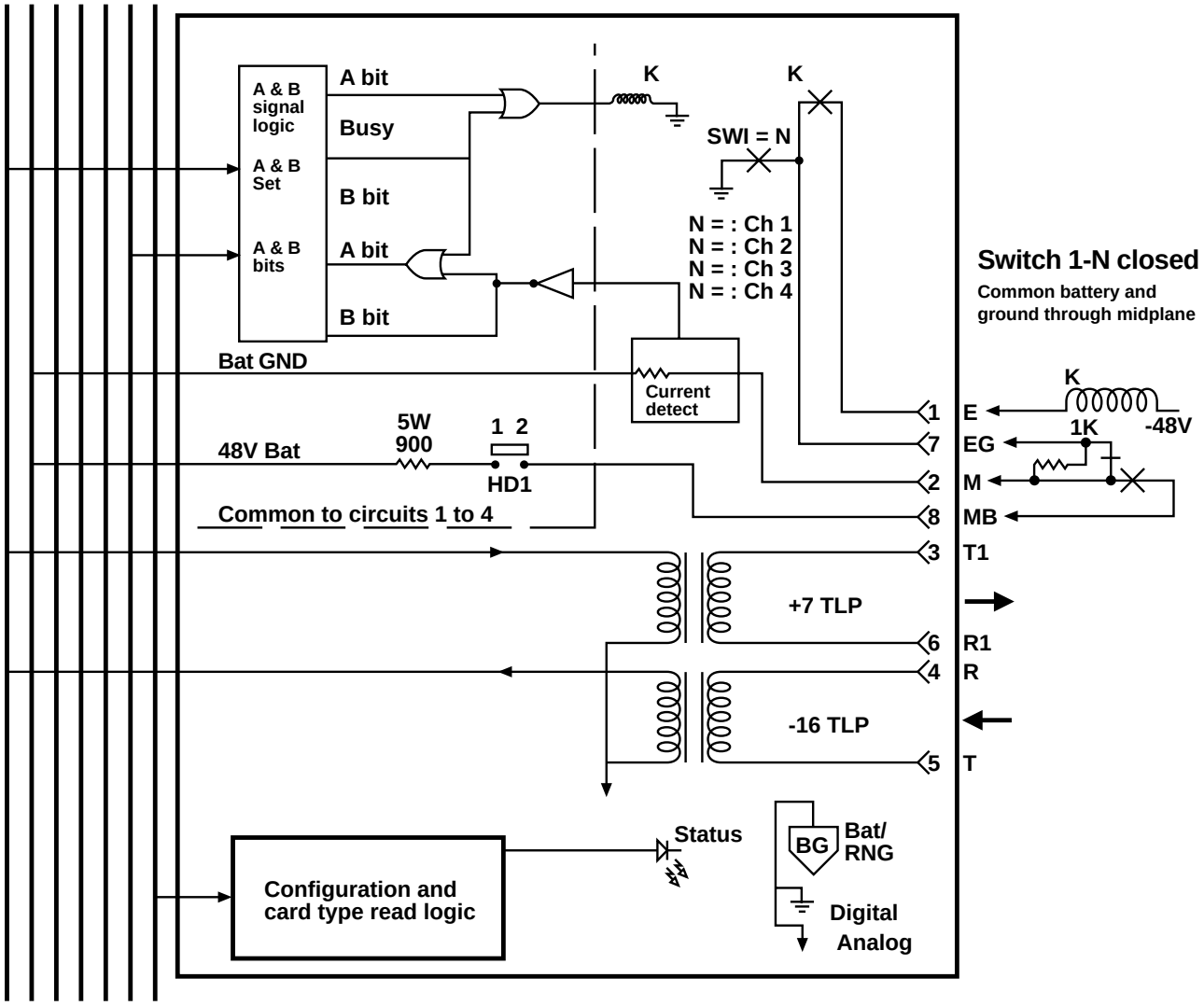


Fig. 6-20. Type III Signaling.

6.10 Quad 2-Wire FXS Rear Plug Assembly (MT447C)

Fig. 6-21 is a block diagram for the FXS rear plug assembly.

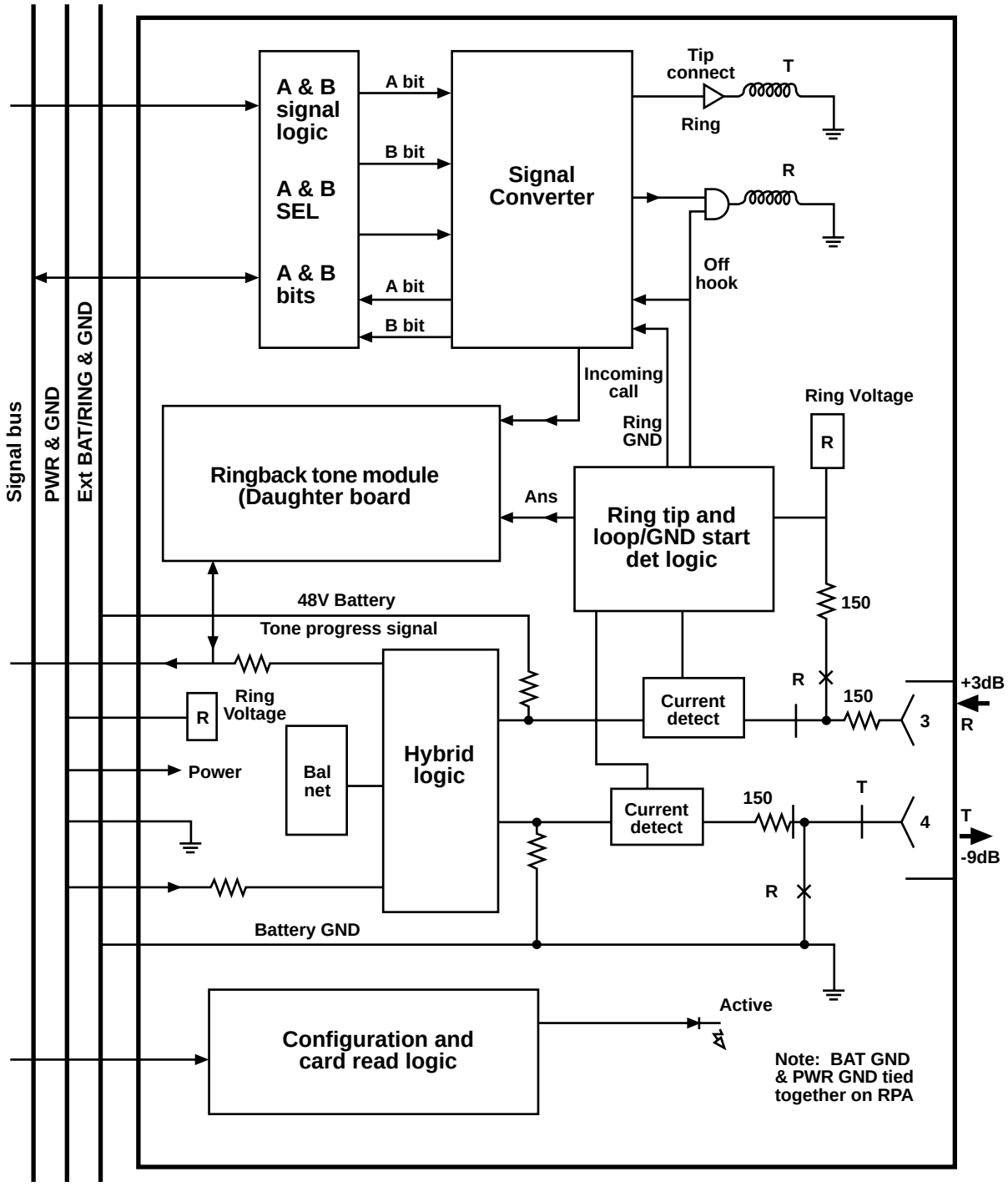
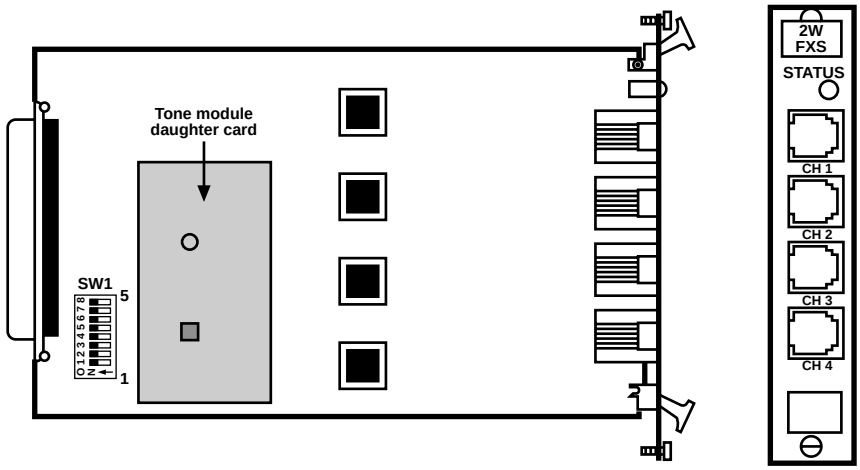


Fig. 6-21. Block Diagram for the 2-Wire FXS Rear Plug Assembly.

See the table in **Fig. 6-22** to locate the switch selections you need.



Loop/Ground Start Selection			
	SW1	SW2	SW3
Loop start-standard	Off	Off	Off
Ground start-standard	On	Off	Off
Loop start-conversion	Off	On	Off
Loop start-conversion	On	On	Off
Loop start-auto matic ring down	Off	Off	On
Ground start-auto matic ring down	On	Off	On

STATUS INDICATOR

ON - Compatible plug-in is inserted into front slot.

OFF - No front plug-in.

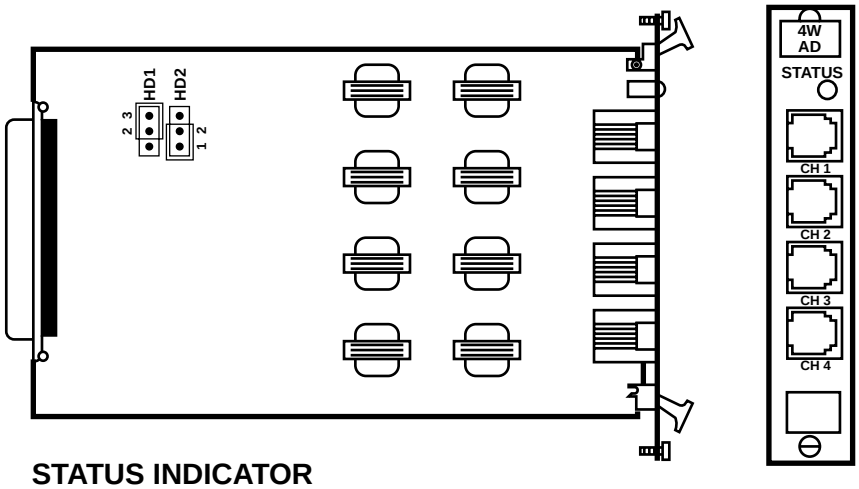
BLINKING - Non-compatible plug-in is inserted into front slot.

Fig. 6-22. 2-Wire Station End (FXS) Rear Plug Assembly.

WARNING

If you remove the front QPCM card from a rear FXS card, noise will be generated on ALL channels signaling time slots. To avoid this noise, follow this guideline: remove the rear card first. Then remove the front card.

To insert an FXS card, observe the reverse process —install the QPCM card first. Then push in the FXS rear card because the signaling intelligence is on the rear card of an FXS set. Without having a front card installed first, the leads will float and will cause noise.



STATUS INDICATOR

ON - Compatible plug-in is inserted into front slot.

OFF - No front plug-in.

BLINKING - Non-compatible plug-in is inserted into front slot.

Fig. 6-23. Block Diagram for the 2-Wire Office End (FXO) Rear Plug Assembly.

6.11 Quad 2-Wire FXO Rear Plug Assembly (MT448C)

There are no field-replaceable fuses on this card.

Verify Header and Switch selections. See **Fig. 6-24** to locate these headers and switches.

- SW 1 Not used, factory set to all ON

- HD1 through HD4

  • 1-2 900 ohms

  • 2-3 600 ohms

HD5 and HD6

  • 1-2 Ground start mode

  • 2-3 Loop start mode

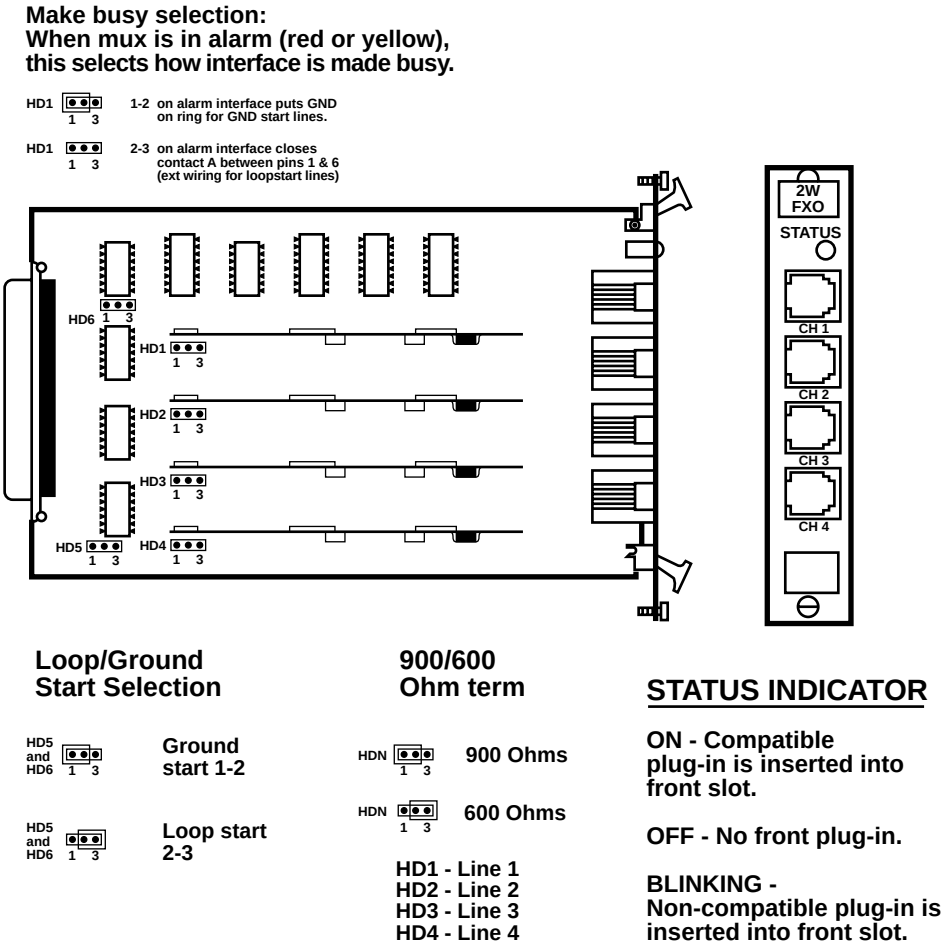


Fig. 6-24. Quad 2-Wire FXO Rear Plug Assembly.

6.12 Quad 4-Wire Analog Data (AD) Assembly (MT418C)

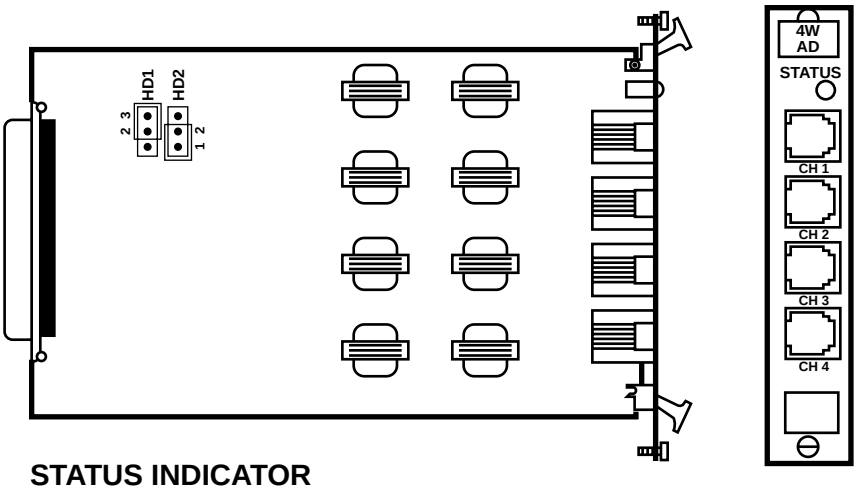
See **Fig. 6-25** for an illustration of this assembly. The AD assembly provides a transmission level of +13 TLP (transmission level point) on the transmit pair and -3 TLP on the receive pair. You use this assembly to interface analog modems for voice-band transmission over a T1 circuit. Modem levels are 13dB or 15dB below the transmission level point. Which level is used depends on what common carrier network the VF circuit interconnects. Use the following guideline in **Table 6-5** to set the analog settings:

Table 6-5. 4-Wire Analog Level Setting.

Common Carrier Network	TX (+13TLP)	RX (-3TLP)
-5 dBmo networks*	-2dBm	-18dBm
-13 dBmo networks*	0dBm	-16dBm
Pt-Pt Application**	0dBm	-16dBm

*Network access applications where only one T1 Channel Bank multiplexer is used to access a nationwide common carrier network.

**Pt-Pt uses T1 Channel Bank multiplexers on both ends of a T1 circuit.



STATUS INDICATOR

ON - Compatible plug-in is inserted into front slot.

OFF - No front plug-in.

BLINKING - Non-compatible plug-in is inserted into front slot.

Fig. 6-25. Layout of the 4-Wire Analog Data Rear Plug Assembly.

There are no field-replaceable fuses on this card.

HD1 jumper selects the time-out on the loopback circuit. Setting HD1 to 1 and 2 selects 20 minutes of loopback, and then the loopback will terminate. Setting HD1 to 2 and 3 selects 4 minutes of loopback (the factory default).

HD2 jumper selects the frequency to initiate the loopback command. Setting HD2 to 1 and 2 selects 2813Hz (the factory default) as the loopback frequency. Setting HD2 to 2 and 3 selects 2713Hz as the loopback frequency.

Fig. 6-26 is a block diagram for the quad 4-wire analog data (AD).

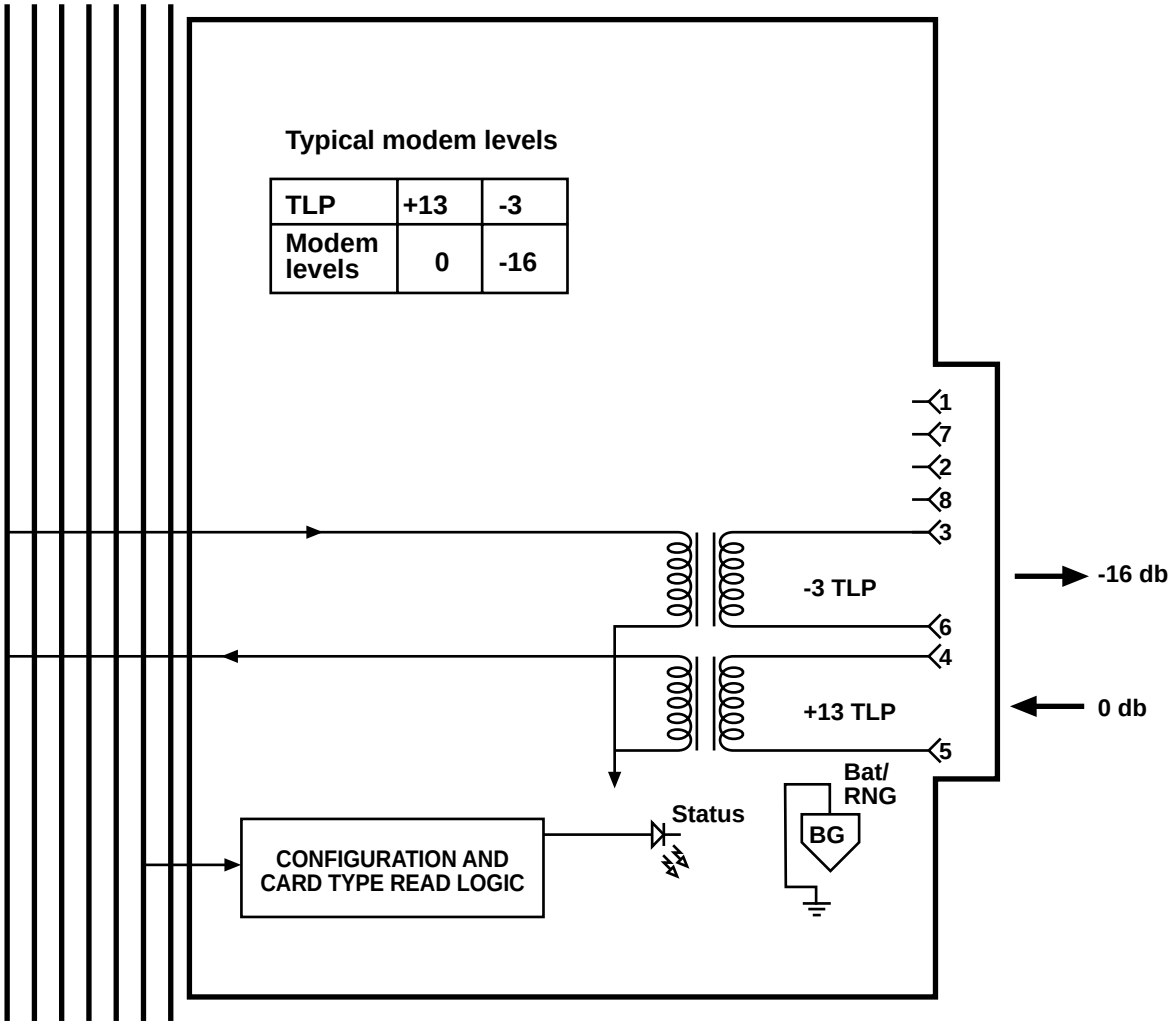


Fig. 6-26. Block Diagram for the 4-Wire Analog Data Rear Plug Assembly.

6.13 High Speed Data Card (Single) (MT450C)

Front Plug Assembly

Fig. 6-27 is a block diagram for the high-speed data plug assembly.

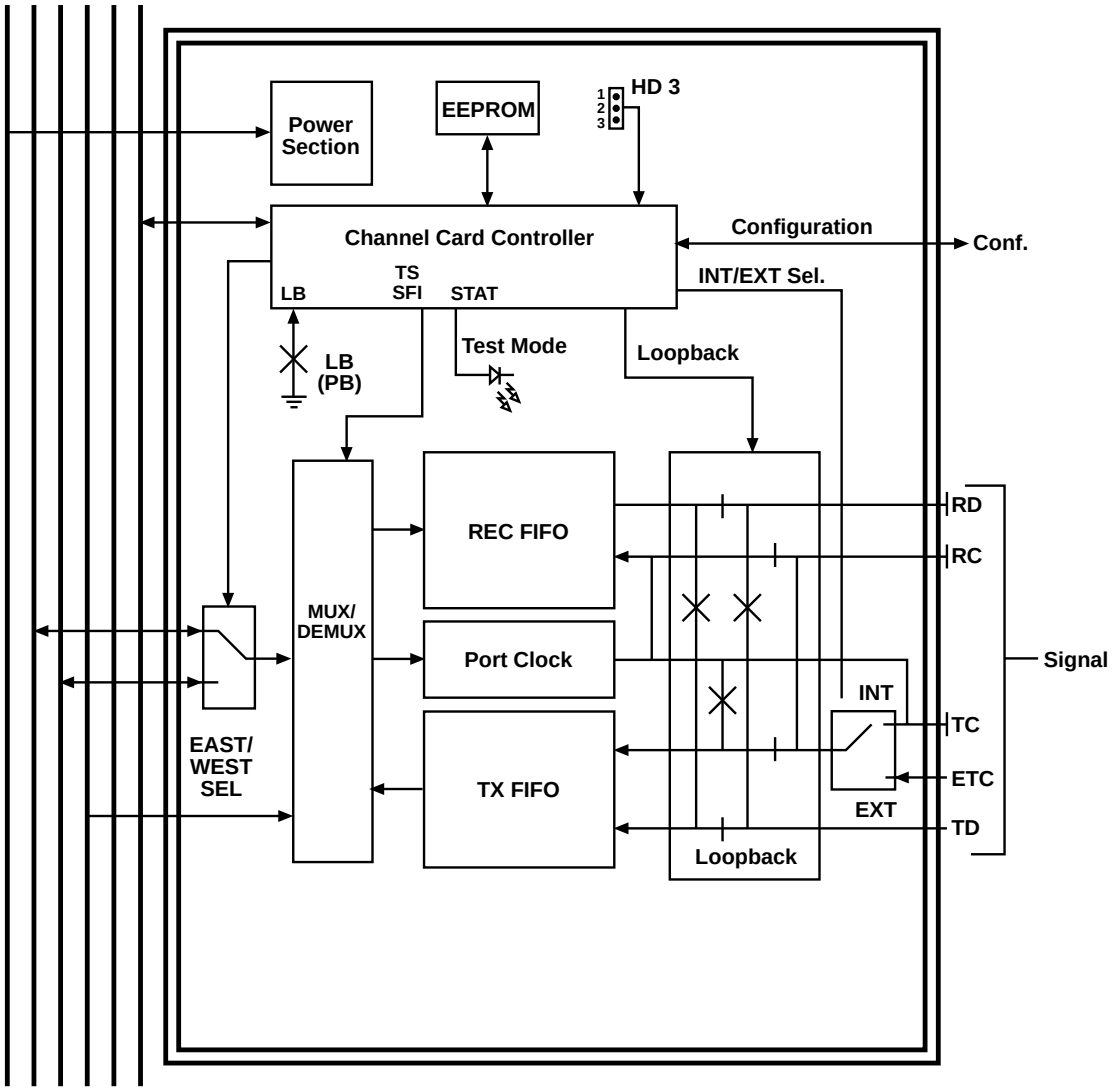


Fig. 6-27. Block Diagram for the High-Speed Data Front Plug Assembly.

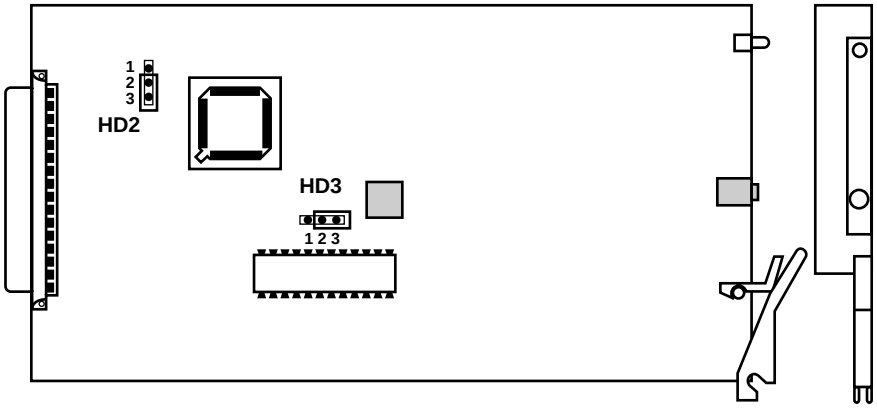
The key logic on the data card is the FIFO buffers, which bridge the time burst of 1.544-Mbps T1 internal bus signals into continuous clock and data signals at the channel interface. This card can receive and insert up to 24 time slots to provide a 1,536 Kbps data rate. You can insert data in seven (7) bits out of the available 8 of a DS0 for a root rate of 56 Kbps, or you can use all 8 bits for a root rate of 64 Kbps. When you select N x 56 mode, bit eight is always a "1". When you select N x 64, the T1 line must be configured with B8ZS, and the network services must be capable of clear channel operation. Thus the data card can be configured to operate in steps of 56 or 64 Kbps up to 1344 or 1536 Kbps.

Front Plug Assembly Selections

This has N x 56/64 capability. There are no field-replaceable fuses on this card. Verify header and switch selections. See **Fig. 6-28** for jumper positions and header and switch selections. The T1 high-speed data card has LEDs that show the status as either active (on steady) or loopback (blinking). The switches on this card are loopback (LDL).

- HD2 - Factory Test Header must be set to position 2-3.

- HD3 - Factory Set Header must be set to 2-3.



FACTORY SET HEADERS: 2-3

LED status indicators:

ON - active channel

OFF - channel not assigned to DSO or in alarm

BLINKING - channel in loopback

LOOPBACK SWITCH:

• Activate channel loopback by depressing switch until status LED starts to blink.

• Deactivate channel loop by depressing switch until status LED stops blinking.

• Disable during alarm condition.

Fig. 6-28. High Speed Data Front Plug Assembly.

6.14 Dual Data Card (MT470C)

Front Plug Assembly

The dual data card (DDC) front plug assembly contains two 56/64 Kbps digital data channels. The DDC is designed to mate with OCU (office channel unit card) and dual digital (V.35/RS-422/RS-232) rear interface assemblies. The DDC supports the following:

- AT&T standard non-latching network loopback codes
- MCC network management loopback controls
- Manual front-panel pushbutton loopback activation

Fig. 6-29 shows a block diagram of the DDC. Only one circuit is illustrated to simplify the diagram. The DDC card is a 56/64 Kbps channel card. The key logic on the DDC is the rate converter buffer that changes the channel's continuous data into a time burst T1 DS0 signal. Through the MCC configuration menu the two channels can be assigned to either the East or West T1. The MCC also permits each channel to be assigned to any one of 24 DS0 time slots.

The receive-rate converter operates from the system port clock, which is synchronized to the East T1 timing. This RC clock is the clock that interfaces to the rear plug assembly. The transmit-rate converter clocks transmit data either by selecting the port clock (internal mode) or an external clock (external mode). This selection is made through the MCC configuration menu. When external clock is used, the device connected to the channel interface must be in loop timing or synchronized to the East T1 circuit.

A local digital loopback (LDL) circuit provides a loopback in both the T1 and channel interface direction. This loopback is activated by the front-panel pushbutton switch or via the MCC network-management system when mated with all types of rear plug-in cards.

- When the dual data interface card is mated with the DDC, the AT&T network nonlatching loopback codes (OCU, CSU, DSU) detected in the DS0 will also activate the LDL loopback.
- When an OCU-DP is mated with the DDC, the non-latching network loopback codes are passed on to the rear OCU-DP card to individually affect their respective OCU, CSU, and DSU loopback functions.

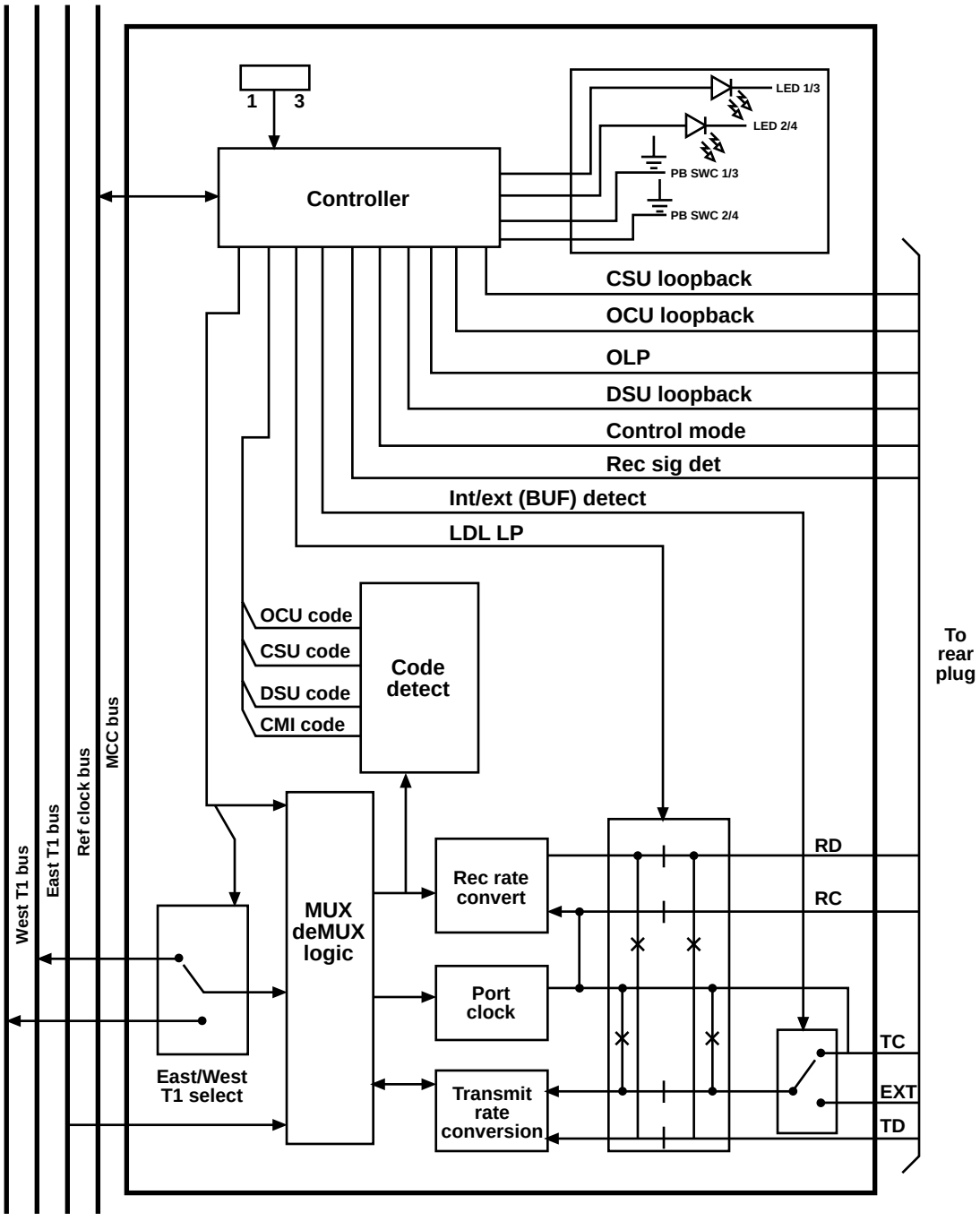


Fig. 6-29. Dual Data Card Front Plug Assembly.

Modes of Operation

See **Fig. 6-30** for the layout of the DDC card.

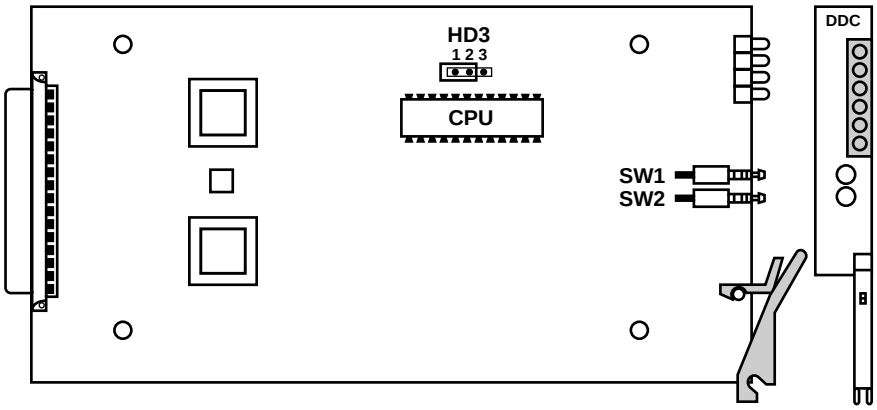


Fig. 6-30. High-Speed Dual Data Card Front Plug Assembly, the DDC.

MCC Options

The DDC supports 56, 64, and switched 56 Kbps and SW56 E&M service. These modes are selected through the MCC network management system. How these modes are used and their application will depend on what rear plug assembly is mated with the DDC. See **Table 6-6** for a description of modes.

Table 6-6. MCC Modes

MCC Selection	DSU-DP	OCU-DP
56	56 Kbps	56 line rate
64	64 Kbps	72 Kbps line rate
SW 56	56 Kbps*	56 line rate* (US West)
SW 56 E&M	56 Kbps*	Other carrier
*In the SW 56 mode, the receive A signaling bit is used to put the rear interface into control mode idle or data mode. If the A signaling bit is 0, it is in control mode idle. If the bit is a 1, then it is in data mode.		

LED Switches and Loopback Controls

Table 6-7. LEDs When Mated with a DSU-DP.

CHAN 1	CHAN 2	LED Status
LED 1	LED 2	OFF—channel not assigned ON—channel assigned to DS0 FLASHING—When MCC or push button activated loopback
LED 3	LED 4	OFF—not used ON—not used FLASHING—When network loopback control codes are received in the DS0.

Table 6-8. LEDs When Mated with an OCU-DP

CHAN 1	CHAN 2	LED Status
LED 1	LED 2	OFF—channel not assigned ON—channel assigned to DS0 FLASHING—When MCC or pushbutton activates loopback.
LED 3	LED 4	OFF—no receive line signal is being detected on the OCU-DP 4-wire line. This indicates a carrier fail condition from the 56 Kbps DSU/CSU connected to the OCU-DP. ON—Line signal is being detected from the 56 Kbps DSU/CSU. FLASHING—When network loopback control codes are received in the DS0 or MCC activates loopback.

Front-Panel Switches

The front-panel switch puts the DDC card into and out of Local Digital Loopback (LDL). This provides a loopback to both the DS0 and the channel interface. This is indicated by flashing LEDs 1 and 2 for channels 1 and 2 respectively.

Loopbacks

Three separate control elements can generate loopback actions:

- Manual front-panel pushbutton
- MCC control
- Receiving network DS0 non-latching loopback control codes (OCU, CSU, DSU)

What type of loopback action will result when a control element activates a loopback will depend on the type of matching rear card.

A brief description of the cards and loopback capability follows.

OCU-DP (MT476C)

The OCU-DP rear card has the following loopback logic circuits:

- QLB: This provides a loopback to the DSU/CSU and can be activated by the MCC without the channels being assigned to a DS0. This loopback is used to verify the OCU-DP, Cabling and the 56 Kbps DSU/CSU.
- OCU: This provides a bipolar loopback of the DDS signal to the T1 DS0.
- CSU: This causes the OCU-DP to reverse sealing current which will put a CSU/DSU into CSU loopback. (This requires 48V power supply connected to rear power module.)
- DSU: This causes the OCU-DP to transmit a control code to put CSU/DSU into a DSU loopback.

Control of Loopbacks

Tables 6-9 and **6-10** illustrate each control element and which loopback it controls for both the DSU-DP and OCU-DP rear interface cards.

Table 6-9. Loopback Control with DSU-DP.

Control	Description	Loopback	Device tested
Manual PB	Manual/local	LDL	DDC
MCC Control	VT100 modem	LDL	DDC
OCU		LDL	DDC
CSU		LDL	DDC
DSU		LDL	DDC
Network Codes RX in DS0			
OCU		LDL	DDC
CSU		LDL	DDC
DSU		LDL	DDC

Table 6-10. Loopback Control with OCU-DP.

Control	Description	Loopback	Device tested
Manual PB	Manual/local	LDL	DDC
MCC control*	VT-100/modem		
LDL		LDL	DDC
QLB		OLB	OCU-DP
OCU		OCU	OCU-DP
CSU		CSU	DSU/CSU
DSU		DSU	DSU/CSU
Network Codes RX in DS0			
OCU		OCU	OCU-DP
CSU		CSU	DSU/DSU
DSU		DSU	DSU/CSU

*Full MCC control is via the DDC monitor/test menu. The loopback menu that displays the time slots will only control the LDL loopback.

6.15 Dual Data Card (DSU-DP) Rear Interface

There are no field-replaceable fuses on these cards. See **Fig. 6-31**. The rear plug assembly uses the V.35, RS-232 , and RS-530 cards (MT471C, MT473C, and MT472C).

See **Fig. 6-33** through **6-35** for block diagrams of the three rear plug assemblies. See **Tables 4-16** through **4-18** that show the connector pinouts for these interfaces.

HD1 and HD3

- 1-2 Frame ground
- 2-3 Frame ground through 100 ohms resistor
- 3-4 Floating (factory)

-HD2 and HD4

- 1-2 Signal ground (factory)
- 2-3 Signal found through 100-ohm resistor
- 3-4 Floating

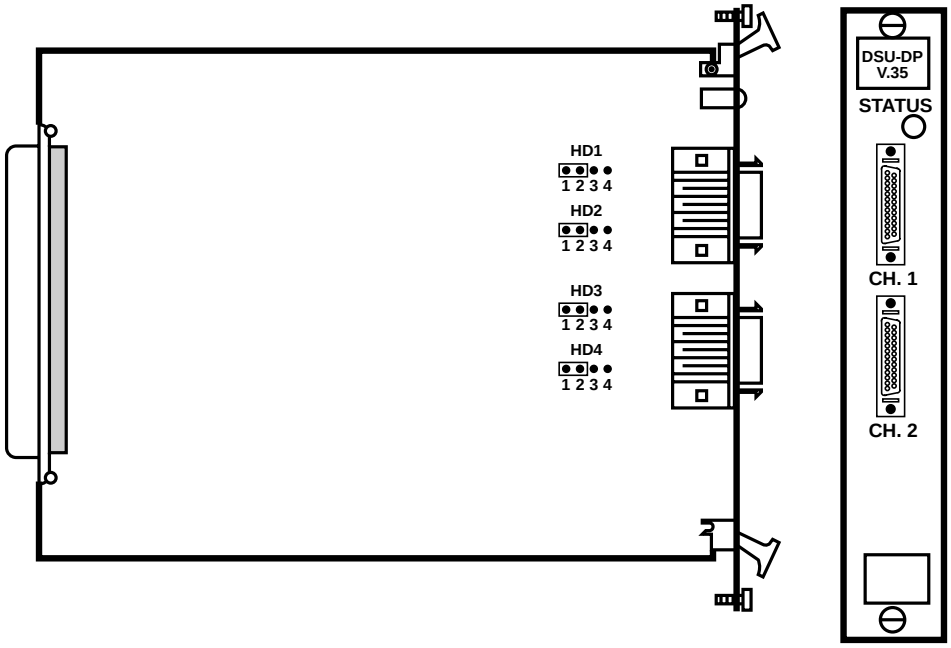


Fig. 6-31. Dual Data Card (DSU-DP) Assembly, Showing the V.35 Card.

The RS-232 card is the same as shown in **Fig. 6-31** except that the part number of the RS-232 card is MT473C. The RS-530 part number is MT472C.

6.16 Subrate Dual Data Card

The subrate dual data card (SDDC) front plug assembly contains two 9.6 Kbps digital data channels. See **Fig. 6-32**. The SDDC is designed to drive the OCU rear card along with the DDC.

HD1

- 1-2 Factory
- 2-3 Ground PD7

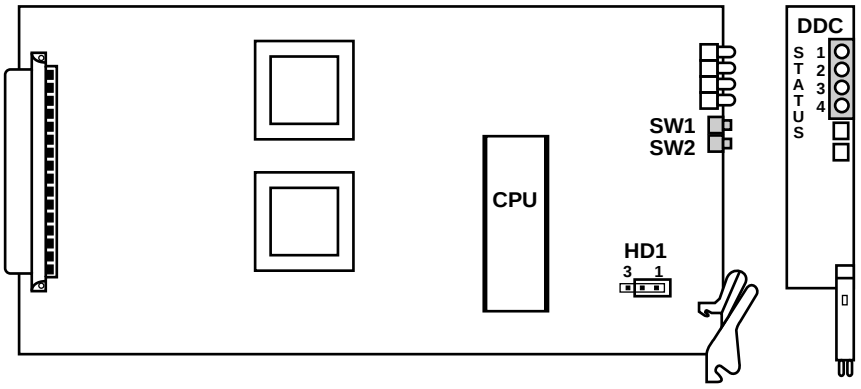


Fig. 6-32. Subrate Dual Data Card Front Plug Assembly.

6.17 High-Speed Data Card Rear Plug Assemblies

There are no field-replaceable fuses on this card. See **Fig. 6-33**. The rear plug assembly (single) uses the V.35, EIA 530 and RS-232 cards. (MT451C, MT452C, MT453C) See **Figures 6-34** through **6-36** for block diagrams of the three rear plug assemblies. See **Tables 4-3** through **4-11** for interfaces showing connector pinouts. The LEDs have active status.

RS-232 Card

- JP1—1 and 2—the DSR is normal.
- JP1—2 and 3—the DSR is tied high.
- JP2—1 and 2—the chassis and signal grounds. The interface is jumpered to frame ground via 100-ohm resistor.
- JP2—2 and 3—the chassis and signal grounds are tied directly to frame ground.
- JP2—3 and 4—the chassis and signal grounds float, and the interface is not tied to frame ground.

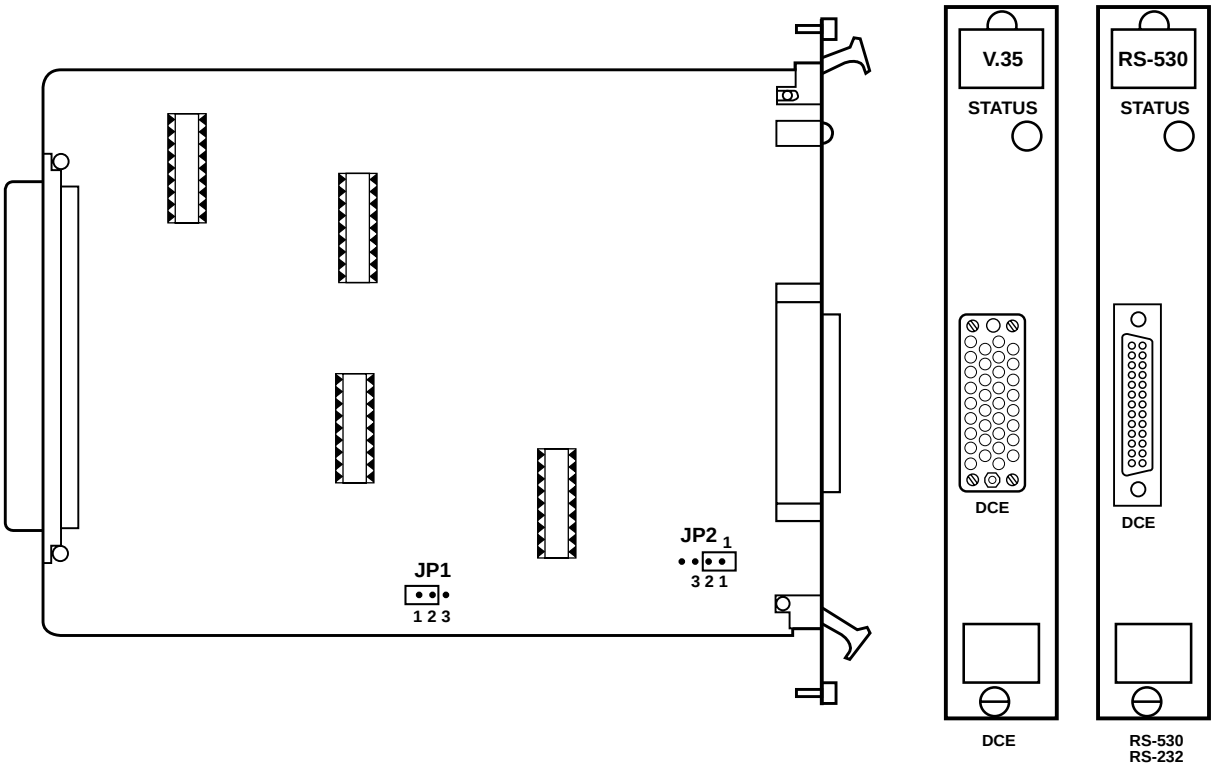


Fig. 6-33. High Speed Data Rear Plug Assembly (single).

NOTE

The block diagrams for the dual high-speed data interface cards—V.35, RS-530, RS-232—are the same as the single RPAs.

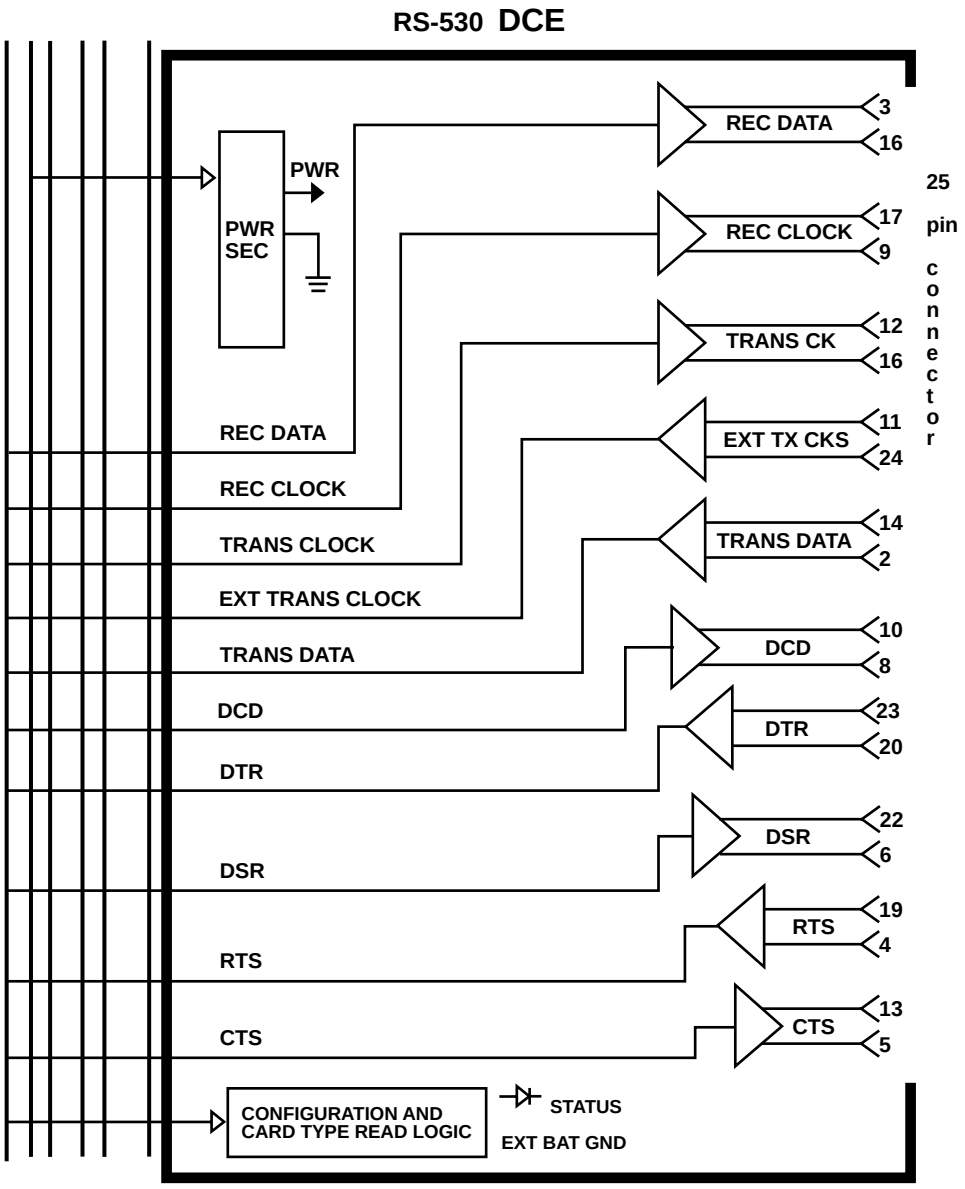


Fig. 6-34. Data Card Rear Plug Assembly, 25-pin (RS-530, single).

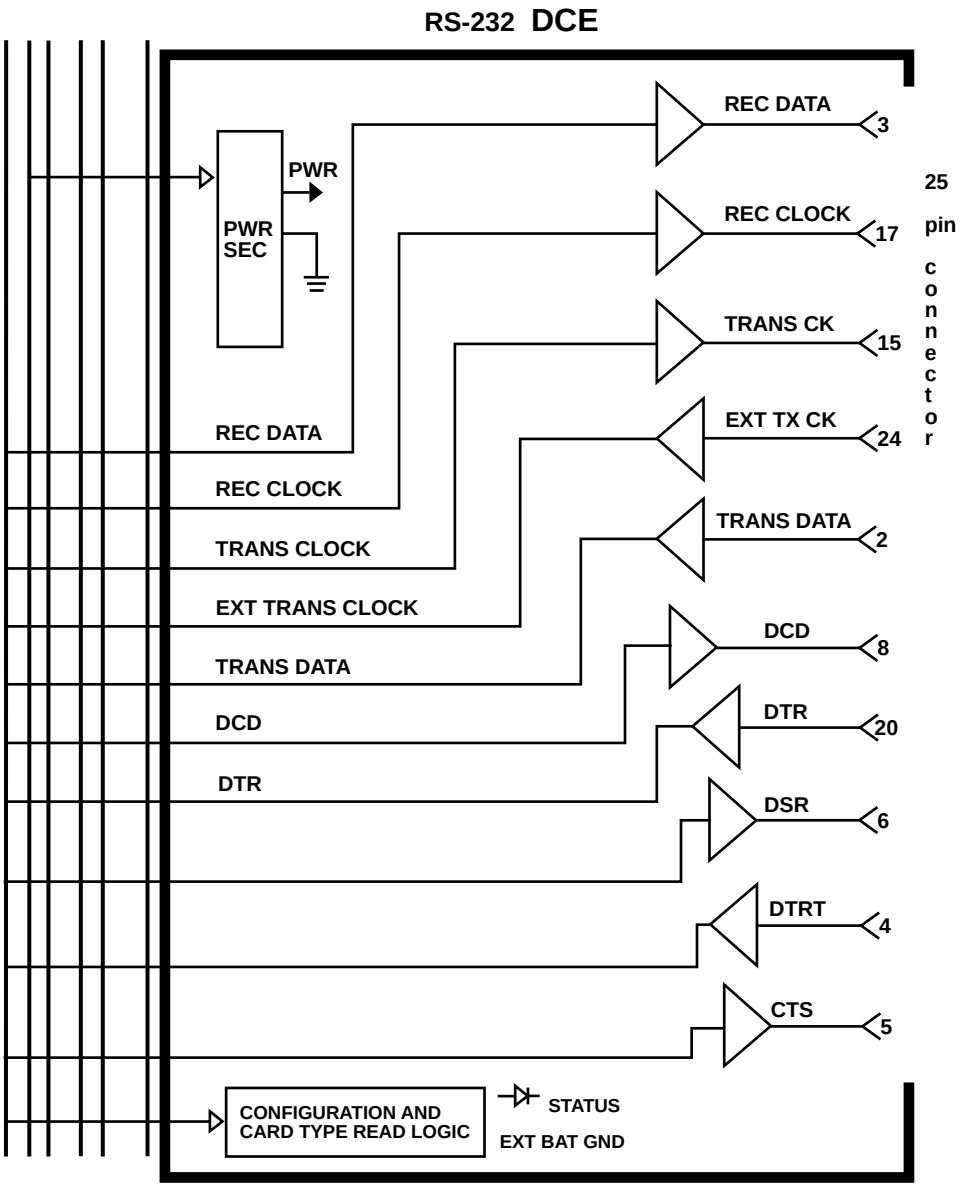


Fig. 6-35. Data Card Rear Plug Assembly, 25-pin (RS-232, single).

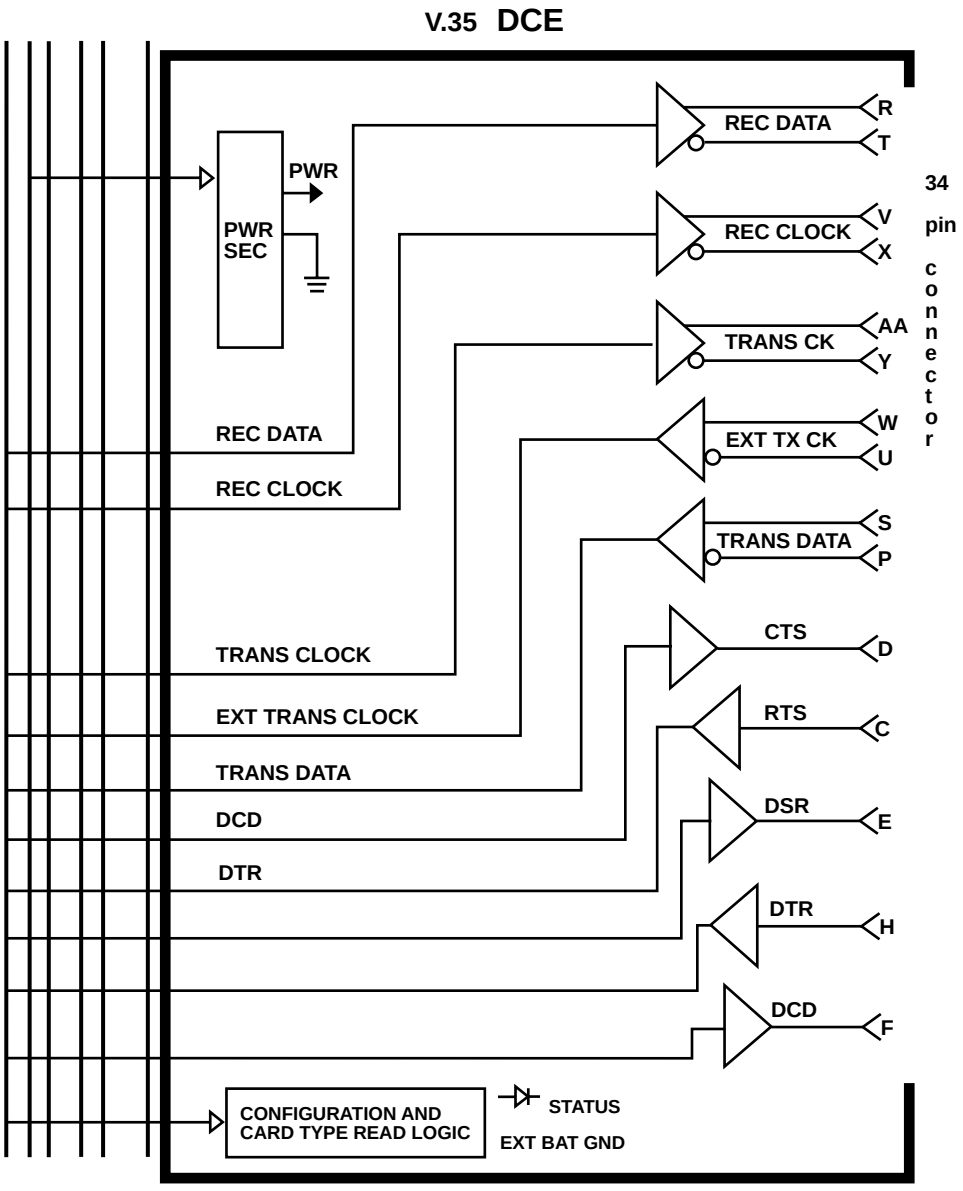


Fig. 6-36. Data Card Rear Plug Assembly, 34-pin (V.35 single).

6.18 Office Channel Unit Data Port

Rear Plug Assembly (MT476C)

The 4-wire OCU-DP rear plug assembly houses two OCU-DP interfaces on one RPA. It is designed to mate with a dual data card (DDC) or SDDC (9.6) front plug assembly. The OCU-DP RPA supports 56 Kbps and 72 Kbps 4-wire line rates. **Fig. 6-37** is a block diagram of the OCU-DP. The OCU-DP is broken into subsections:

- Transceiver
- CSU loopback
- Sealing current
- Line coupling

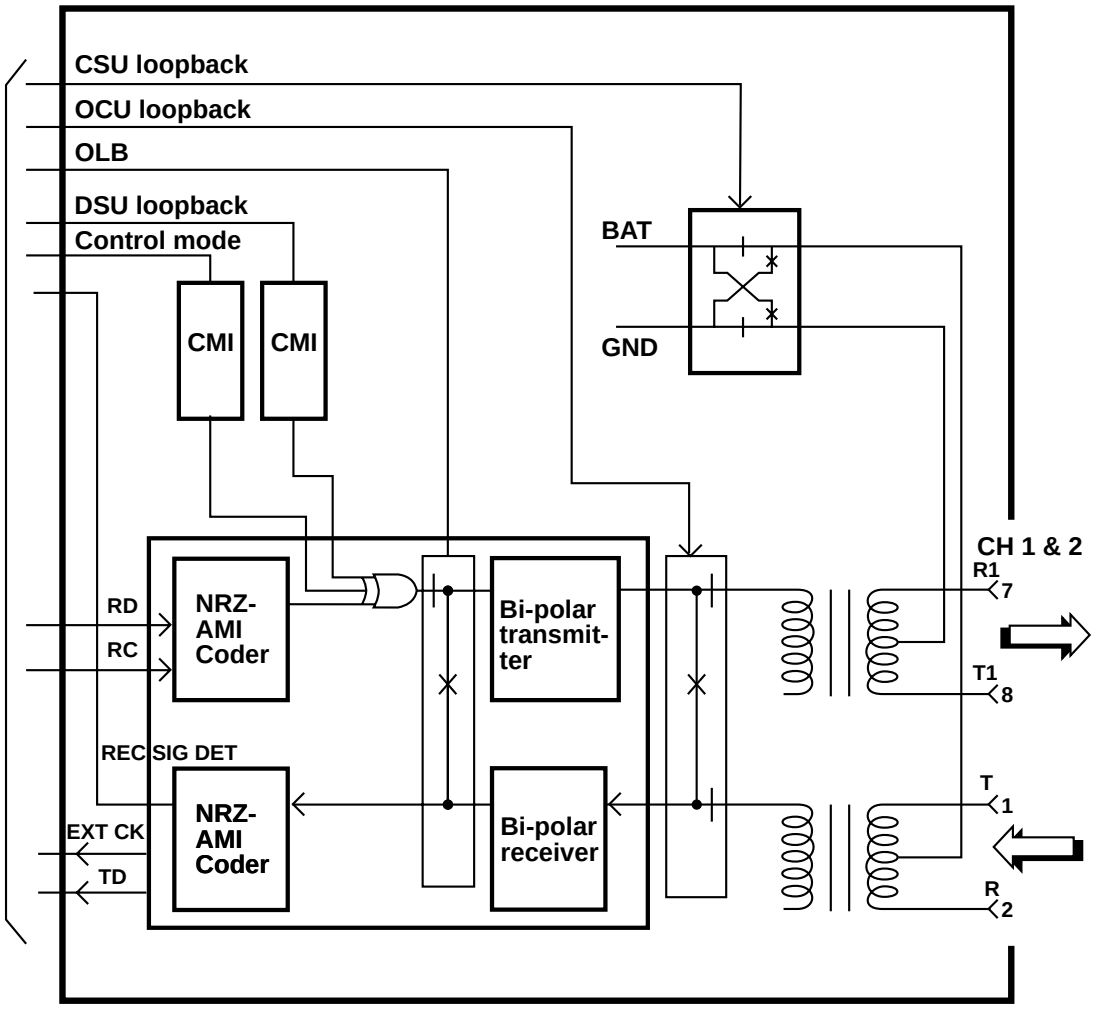


Fig. 6-37. Block Diagram for the OCU-DP Rear Plug Assembly.

The transceiver section interfaces NRZ signals from the front plug assembly DDC into a baseband, bipolar, return to zero 4-wire signal. This signal is referred to as line signal. The transceiver operates at a 56-Kbps line-signal rate or 72-Kbps line-signal rate.

Fig. 6-38 is a physical layout of the OCU-DP RPA. Header straps located on the board (HD1 and HD2) are used for channels 1 and 2 respectively and enable or disable the sealing current (OCU loopback) on the 4-wire interface. The two channels are available on a single modular connector mounted on the RPA.

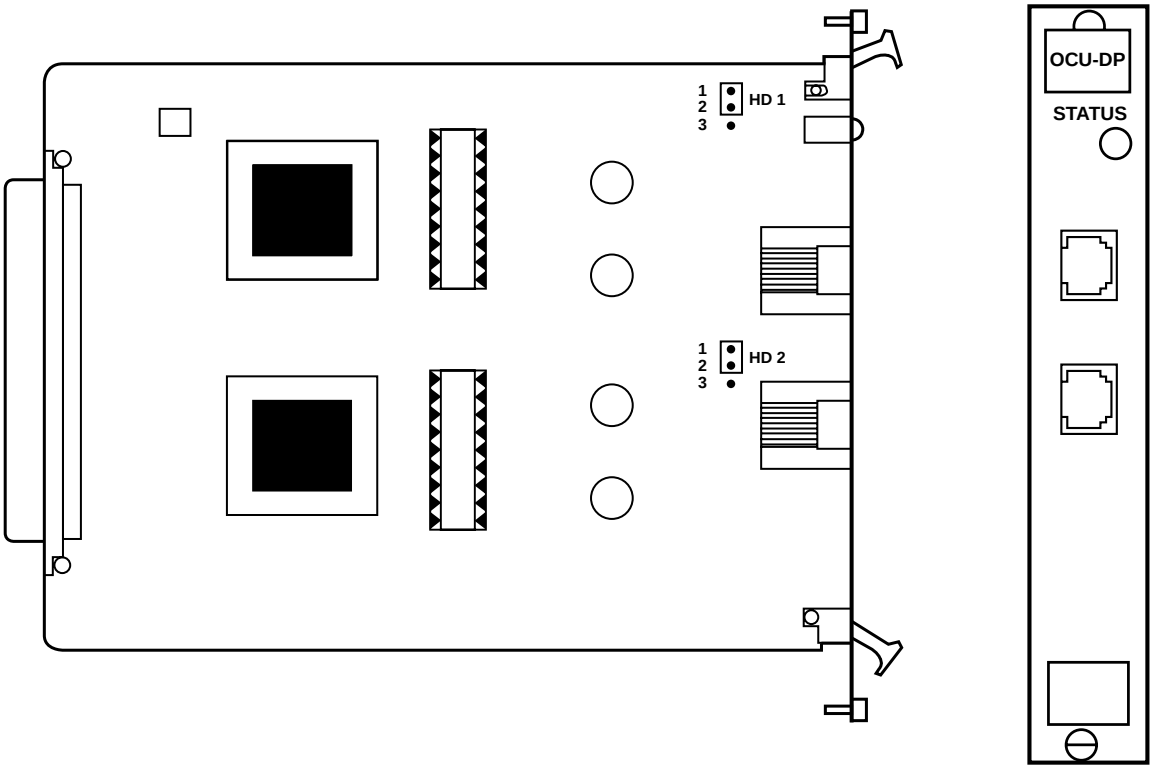


Fig. 6-38. Office Channel Unit Data Port Interface Card.

In the 56-Kbps line-signal mode, the format is bipolar employing violation signaling as described in AT&T Publication 62310. In the 72-Kbps line-signal mode, the format is a 72 Kbps multiplexed signal formatted in 9-bit bytes, containing 7 primary channel data (D) bits, a framing (F) bit, and a shared bit (C/S), according to AT&T Publication 54075. The seven primary channel data (D) bits are mapped into bits 1-7 of a DS0, the C/S bit is mapped into bit 8 of a DS0, and the frame bit is used by the OCU-DP to synchronize the 72 Kbps frame to a DS0 byte. Equipment using this line rate must conform to Publication 54075 and ensure that D bits and C bits never equal all zeros, or it must be engineered on a B8ZS network.

The transceiver is put into the 56-Kbps line-rate mode via the MCC. When you select 56 K or SW-A 56K modes, the transceiver is in the 56-Kbps line-signal rate mode. When 64 Kbps is selected, the transceiver is in the 72 Kbps mode.

In the SW-A 56 mode, the receive A signaling bit is used to put the rear interface into control mode idle or data mode. If the A signaling bit is a 0, it is in control mode idle. If the bit is a 1, then it is in data mode.

The transceiver also provides a QLB loopback. This loopback is activated via the MCC system and provides a digital loopback to the 4-wire line. This allows a DSU/CSU, cable pairs and OCU-DP card to be tested independently from the T1 network. An OCU-DP/DDC card set does not have to be assigned a DS0 channel to activate this loopback.

For 56 Kbps and SW-A 56 the line rate is 56 Kbps. The network control codes received in the DS0 are converted to bipolar violation code rules on the 4-wire output line. In reverse, bipolar violation code rules on the input line are converted to network control codes in the DS0.

For 64K mode, the line rate is 72 Kbps. The network control codes received in the DS0 are mapped into 8 of the 9 bits of the formatted byte. In reverse, network control codes are generated by the end device and interleaved in bits 1-8 of the transmit DS0.

The OCU-loopback logic provides a loopback to the DS0. This is activated by receiving a network OCU loopback control code or via the MCC.

Sealing current is provided on the 4-wire line and is reversed if a CSU loopback is activated. This is activated by receiving a network CSU loopback control code or via the MCC. (This requires a -48V power supply connected to the rear power entry module or backplane connector.)

The 4-wire line is transformer-coupled with a center tap access for sealing current. The line-coding signal is not sensitive to T and R polarity.

Modes of Operation

Channel 1

- HD-1 1-2 sealing current enabled
  2-3 sealing current disabled

Channel 2

- HD-2 1-2 sealing current enabled
  2-3 sealing current disabled

The OCU-DP rear card has the following loopback logic circuits:

- QLB: This provides a loopback to the DSU/CSU and can be activated by the MCC without the channels being assigned to A DS0. This loopback is used to verify the OCU-DP, cabling and the 56 Kbps DSU/CSU.
- OCU: This provides a loopback to the T1 DS0.
- CSU: This causes the OCU-DP to reverse sealing current which will put a CSU/DSU into CSU loopback. (This requires a -48V external power supply.)
- DSU: This causes the OCU-DP to transmit a control code to put CSU/DSU into a DSU loopback.

Table 6-11. OCU-DP Logic Circuits

Control	Description	Loopback	Where
Manual PB	Manual/local	LDL	DDC
MCC Control	VT100 modem		
LDL		LDL	DDC
QLB		OLB	OCU-DP
OCU		OCU	OCU-DP
CSU		CSU	DSU/CSU
DSU		DSU	DSU/CSU
Network Codes RX in DS0			
OCU		OCU	OCU-DP
CSU		CSU	DSU-DSU
DSU		DSU	DSU/CSU

6.19 MCC Unit

MCC Front Plug Assembly (MT442C)

The MCC front plug assembly is a microcontroller with three serial I/O ports to permit communications with a system operator and the various hardware elements of the system. The microcontroller operates the VT100 or VT52 menus, holds the shelf configuration, and communicates with shelf plug-in cards. **Fig. 6-39** shows the MCC front plug assembly, and **Fig. 6-41** shows the block diagram.

The three serial I/O ports provide:

- Communication port to the VT100 or VT52 terminal
- Communication port for modem
- MCC NET Series 6000 support

There are no field-replaceable fuses on this card.

Verify Header and Switch selections. See **Fig. 6-39** and **Table 6-12** for these configurations.

Table 6-12. MCC Switch 1 Selections.

4	5	6	MCC baud rate
0	1	0	600
1	1	0	1200
0	0	1	2400
1	0	1	4800
0	1	1	9600 (factory set)
1	1	1	19200

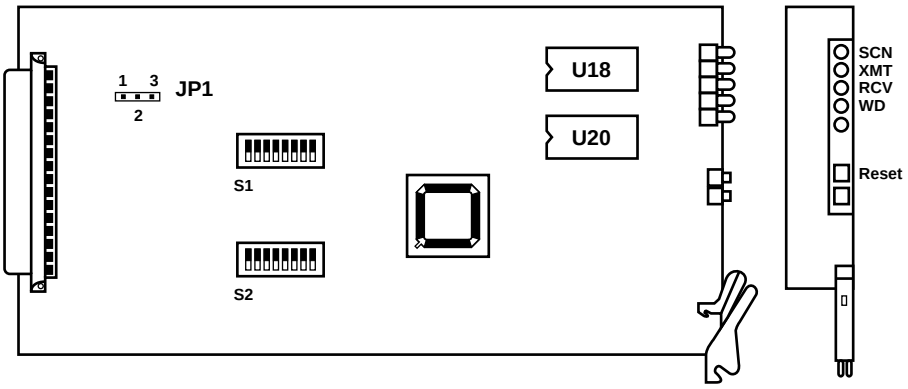


Fig. 6-39. MCC Front Plug Assembly.

Table 6-13. Switch Bank 2 Selections (version 3.3.3 or higher) (All switches are off for factory default).

Switch bank 2	On	Off (default)
Switch 1	Expansion shelf	Standard
Switch 2	MCC dominant	Channel card Dominant
Switch 3	Penril test	Normal
Switch 4	Soft-configured	Smart mode
Switch 5	VT52	VT100
Switch 6		Default, not used
Switch 7		Default, not used
Switch 8		Default, not used

Switch 1—If you need to add an expansion shelf to your 14-slot chassis, this switch should be on.

Switch 2—With this switch on, the MCC configuration is dominant. If the switch is off, the channel cards are dominant.

Switch 4—With switch 4 on, channel cards can be configured with an MCC card, and then you can remove the MCC. If power is lost, the configuration remains.

Switch 5—With switch 5 on, you can use a VT52 terminal.

Configurable Channel Bank

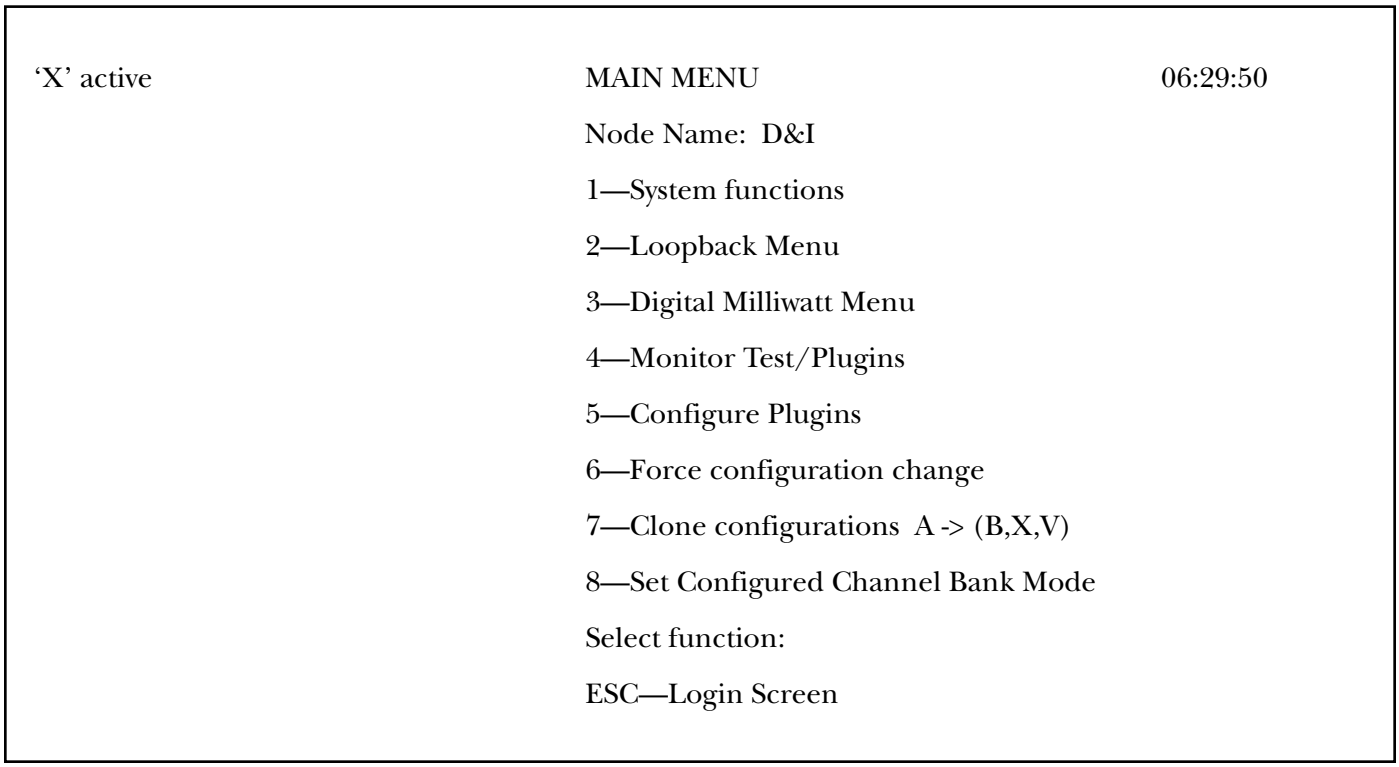


Fig. 6-40. Configurable Channel Bank Mode Option.

Once you have switch bank 2 switch 4 on, you can configure the channel bank using the MCC. Once it is configured, you can remove the MCC card. The configuration will remain the same even if power is lost. Select 8 from the Main menu to use this option to configure the T1 Channel Bank to operate in the A configuration without an MCC card installed. See **Fig. 6-40**.

MCC Rear Plug Assembly (MT443C)

Fig. 6-42 is a block diagram for the MCC rear plug assembly.

See **Fig. 6-43** for the assembly layout.

The rear plug assembly contains three I/O ports:

- P1 is a DCE port that is used to connect to a VT100 or VT52 DTE port.
- P2 is a DTE port that is used to directly connect to a DCE modem type port.
- J2 supports MCC NET.

The current MCC software supports P1 & P2 as a single I/O with both ports enabled. P1 would be used for connections to DTE and P2 for connections to DCE (modem).

There are no field replaceable fuses on this card. There are no header or switch selections.

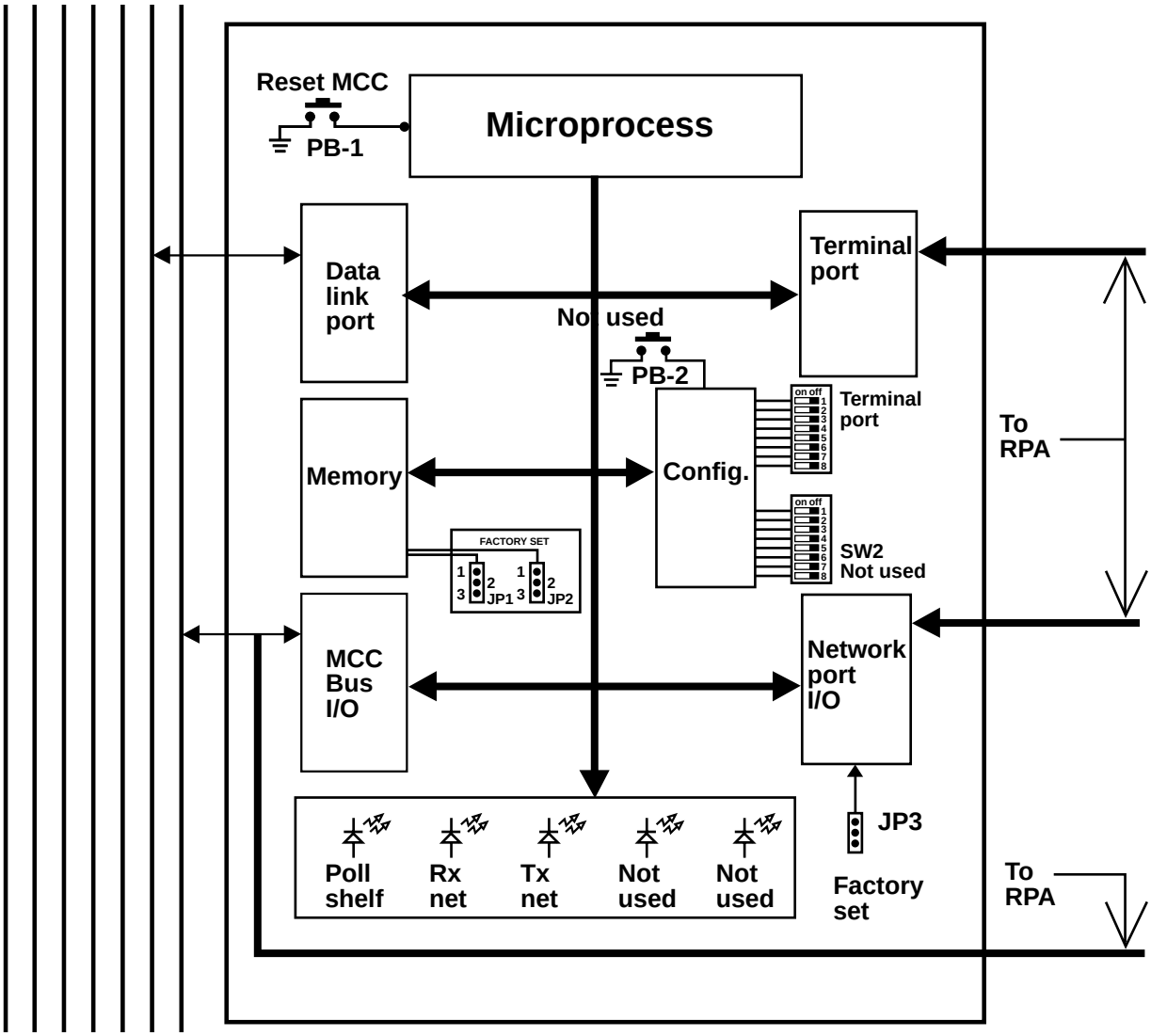


Fig. 6-41. Block Diagram for the MCC Front Plug Assembly.

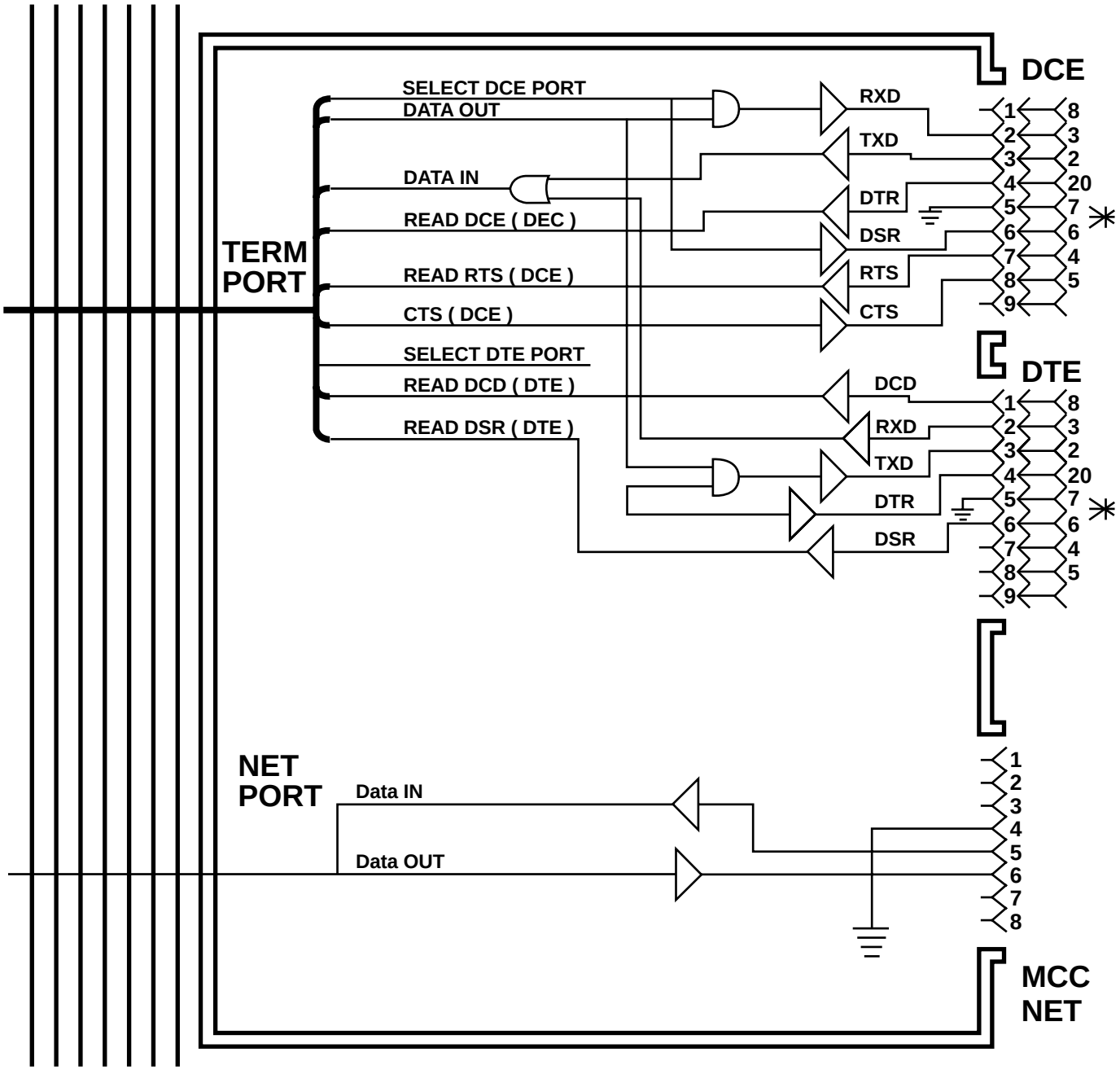


Fig. 6-42. Block Diagram for the MCC Rear Plug Assembly.

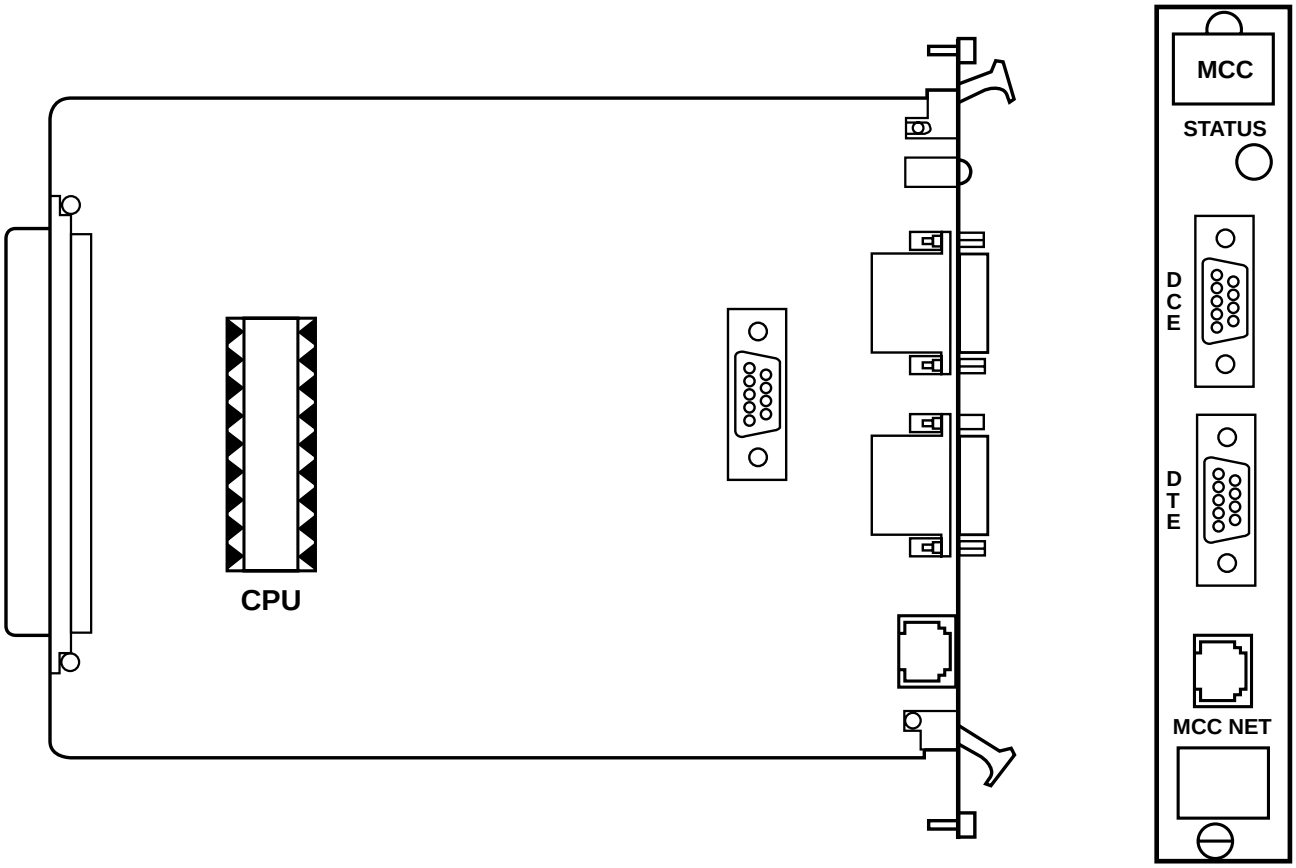


Fig. 6-43. MCC Rear Plug Assembly.

6.20 Dual Modem Card

DMC Front Plug Assembly (MT482C)

Fig. 6-44 shows the front plug assembly and **Fig. 6-45** shows the block diagram.

There are no header selections. There are no field-replaceable fuses on this card.

Switch 1—This is for a channel 2 loopback.

Switch 2—The channel 1 loopback is a bi-directional loopback that loops the data back to the network and also to the modem.

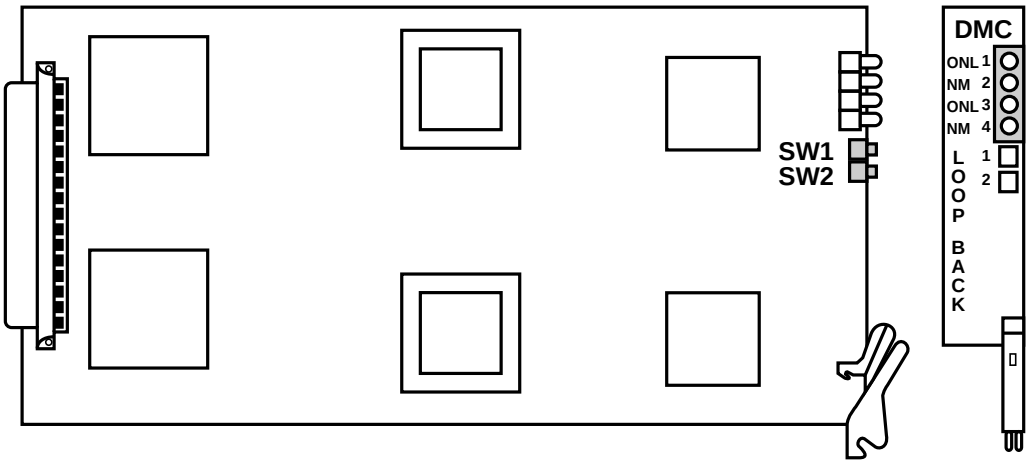


Fig. 6-44. Dual Modem Card Front Plug Assembly.

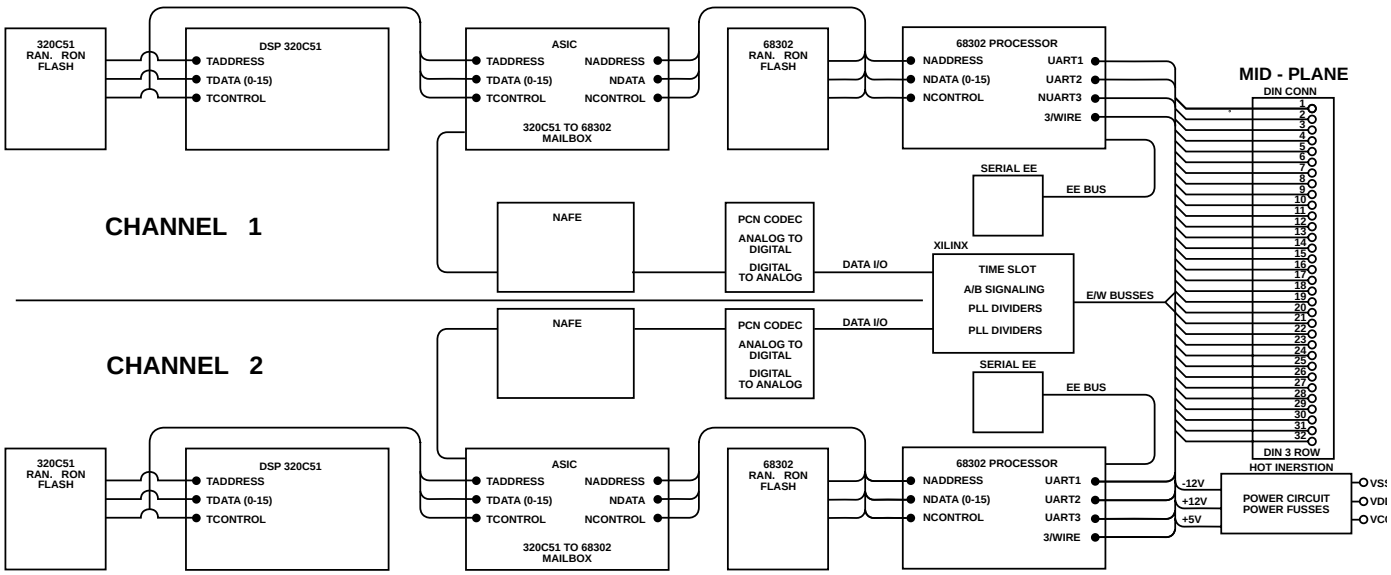


Fig. 6-45. Block Diagram for the Dual Modem Front Plug Assembly.

Rear Plug Assemblies

The rear plug assembly uses the RS-232, V.35, and RS-530 cards. See **Figures 6-48** through **6-52** for rear card block diagrams.

For RS-232 see **Fig. 6-46,** and for RJ-232 see **Fig. 6-47**.

For RS-232, RS-530, and V.35 Cards:

- HD1
  - 1-2 Ground J3-7, default
  - 2-3 Grounded through 100-ohm resistor, J3-7
  - 3-4 Floating J3-7
- HD2
  - 1-2 Frame ground J3-1
  - 2-3 Frame ground through 100-ohm resistor, J3-1
  - 3-4 Floating J3-1, default
- HD3
  - 1-2 Ground J2-7, default
  - 2-3 Grounded through 100 ohm resistor, J2-7
  - 3-4 Floating J2-7
- HD4
  - 1-2 Frame ground J2-1,
  - 2-3 Frame ground through 100-ohm resistor, J2-1
  - 3-4 Floating J2-1, default

RJ-232 Card

- HD1
  - 1-2 Ground J2-7, default
  - 2-3 Grounded through 100-ohm resistor, J2-7
  - 3-4 Floating J2-7
- HD2
  - 1-2 Ground J3-7, default
  - 2-3 Frame ground through 100-ohm resistor, J3-7
  - 3-4 Floating J3-7

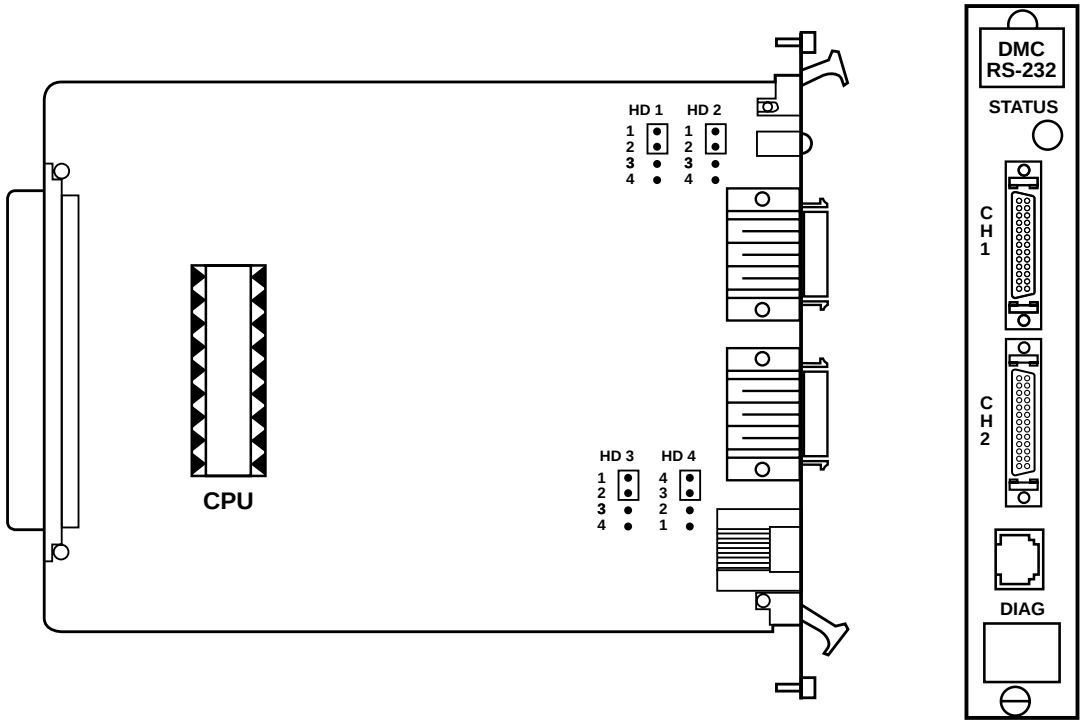


Fig. 6-46. Dual Modem Rear Plug Assembly, Showing the RS-232 Card.

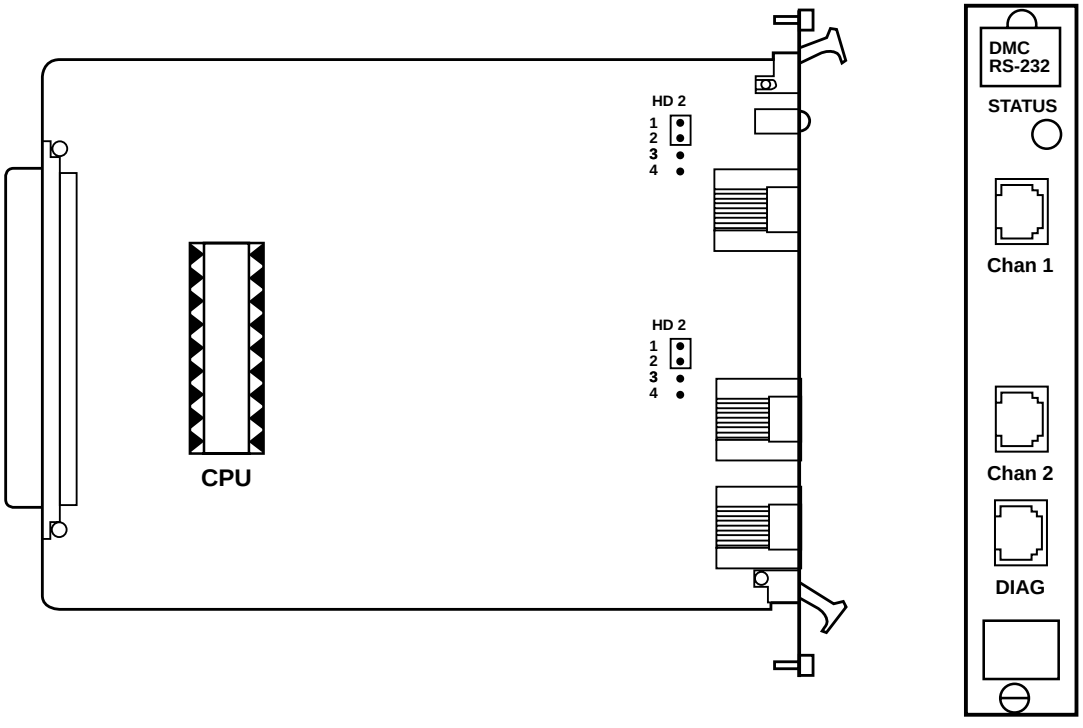
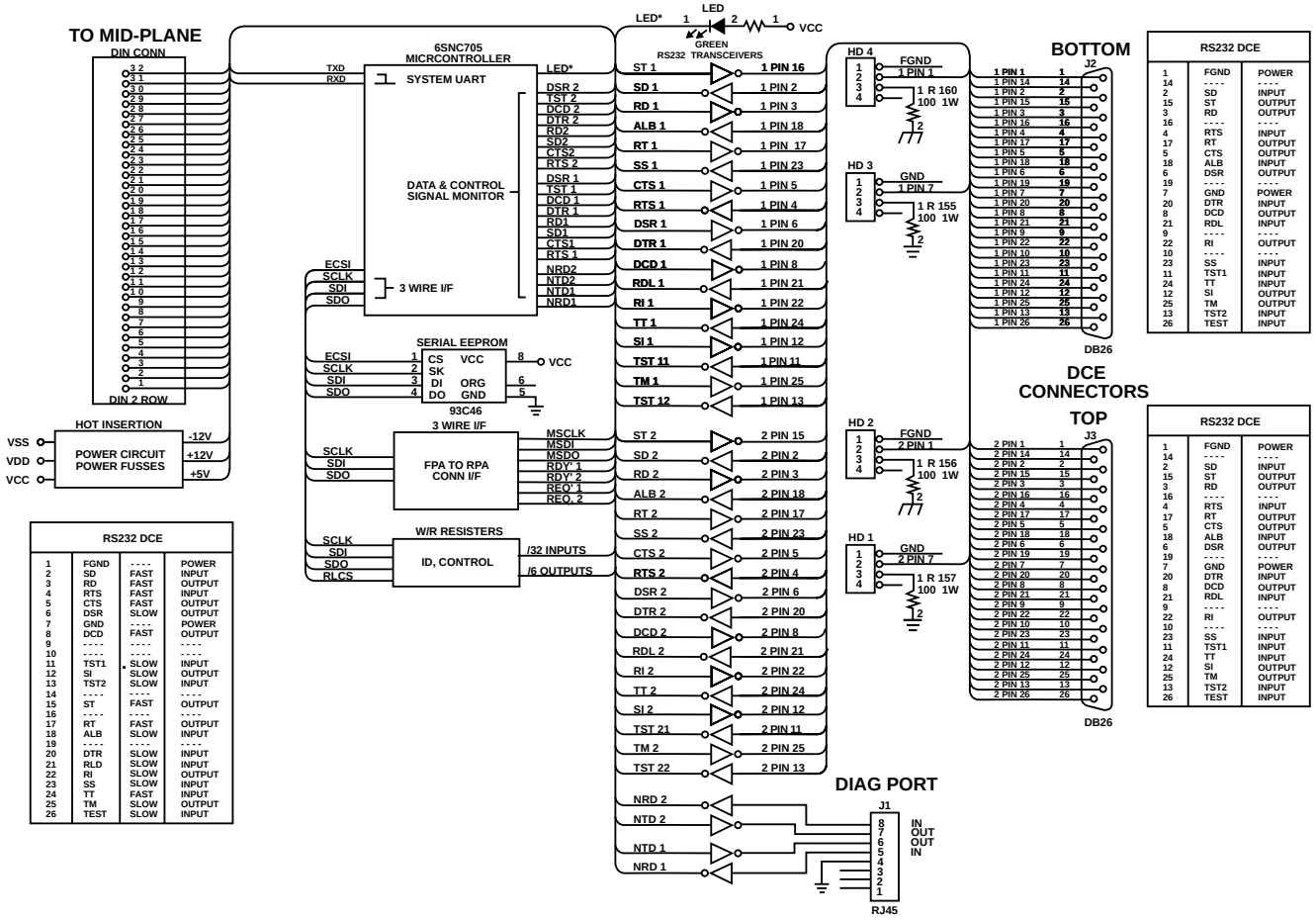


Fig. 6-47. Dual Modem Rear Plug Assembly, Showing the RJ-232 Card.



RS232 DCE

1	FGND	- - - -	POWER
2	SD	FAST	INPUT
3	RD	FAST	OUTPUT
4	RTS	FAST	INPUT
5	CTS	FAST	OUTPUT
6	DSR	SLOW	OUTPUT
7	GND	- - - -	POWER
8	DCD	FAST	OUTPUT
9	- - - -	- - - -	- - - -
10	- - - -	- - - -	- - - -
11	TST1	SLOW	INPUT
12	SI	SLOW	OUTPUT
13	TST2	SLOW	INPUT
14	- - - -	- - - -	- - - -
15	ST	FAST	OUTPUT
16	- - - -	- - - -	- - - -
17	RT	FAST	OUTPUT
18	ALB	SLOW	INPUT
19	- - - -	- - - -	- - - -
20	DTR	SLOW	INPUT
21	RLD	SLOW	INPUT
22	RI	SLOW	OUTPUT
23	SS	SLOW	INPUT
24	TT	FAST	INPUT
25	TM	SLOW	OUTPUT
26	TEST	SLOW	INPUT

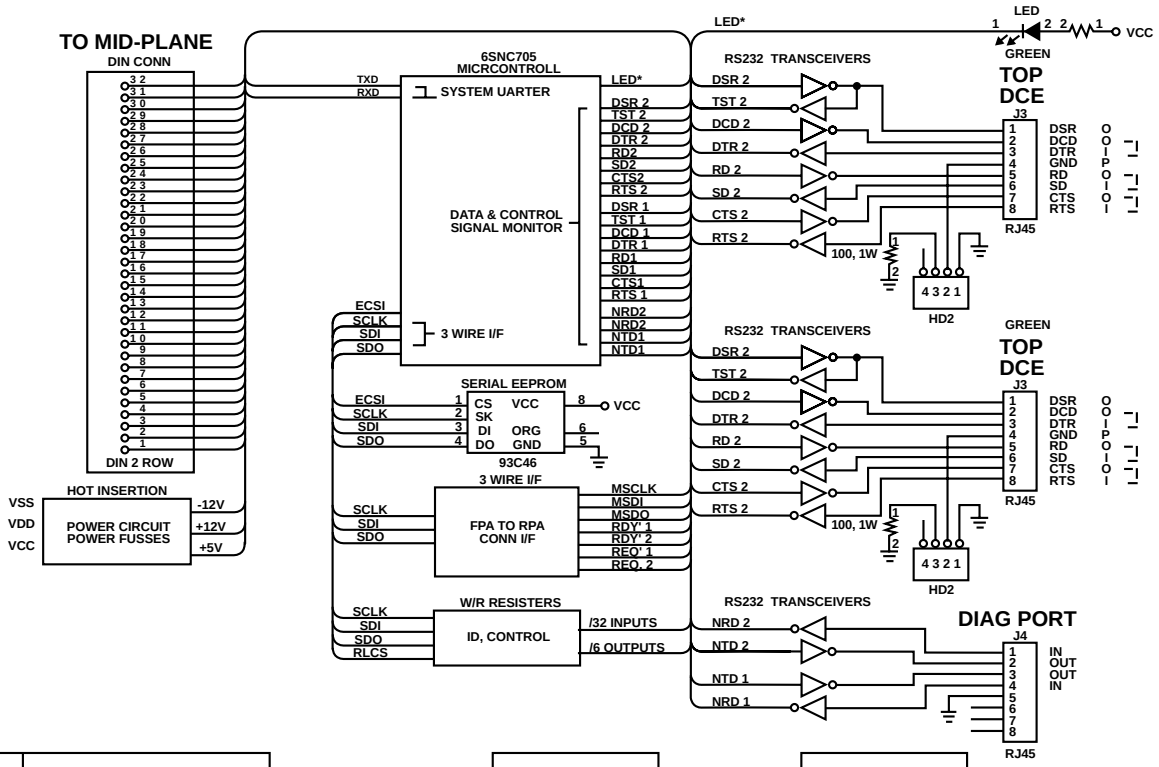
RS232 DCE

1	FGND	POWER
14	- - - -	- - - -
2	SD	INPUT
15	ST	OUTPUT
3	RD	OUTPUT
16	- - - -	- - - -
4	RTS	INPUT
17	RT	OUTPUT
5	CTS	OUTPUT
18	ALB	INPUT
6	DSR	OUTPUT
19	- - - -	- - - -
7	GND	POWER
20	DTR	INPUT
8	DCD	OUTPUT
21	RDL	INPUT
9	- - - -	- - - -
22	RI	OUTPUT
10	- - - -	- - - -
23	SS	INPUT
11	TST1	INPUT
24	TT	INPUT
12	SI	OUTPUT
25	TM	OUTPUT
13	TST2	INPUT
26	TEST	INPUT

RS232 DCE

1	FGND	POWER
14	- - - -	- - - -
2	SD	INPUT
15	ST	OUTPUT
3	RD	OUTPUT
16	- - - -	- - - -
4	RTS	INPUT
17	RT	OUTPUT
5	CTS	OUTPUT
18	ALB	INPUT
6	DSR	OUTPUT
19	- - - -	- - - -
7	GND	POWER
20	DTR	INPUT
8	DCD	OUTPUT
21	RDL	INPUT
9	- - - -	- - - -
22	RI	OUTPUT
10	- - - -	- - - -
23	SS	INPUT
11	TST1	INPUT
24	TT	INPUT
12	SI	OUTPUT
25	TM	OUTPUT
13	TST2	INPUT
26	TEST	INPUT

Fig. 6-48. Block Diagram for the Dual Modem RS-232 Rear Plug Assembly.



MODEM INTERFACE				PC DB9 INTERFACE			
RJ45	SIG	TYPE	DCE DIR	DB9	SIG	TYPE	DTE DTR
1	DSR	SLOW	OUT	1	DCD	FAST	IN
2	DCD	FAST	OUT	2	RD	FAST	IN
3	DTR	SLOW	IN	3	SD	FAST	OUT
4	GND		POW	4	DTR	SLOW	OUT
5	RD	FAST	OUT	5	GND		
6	SD	FAST	IN	6	DSR	SLOW	IN
7	CTS	FAST	OUT	7	RTS	FAST	OUT
8	RTS	FAST	IN	8	CTS	FAST	IN
				9	RI	SLOW	IN

MODEM INTERFACE			ADAPTORC ONNECTION FOR PERSONAL	PC DB9 INTERFACE		
DCE DIR	RJ45	SIG		SIG	DB9	DTE DTR
OUT	1	DSR		DCD	1	IN
OUT	2	DCD		RD	2	IN
IN	3	DTR		SD	3	OUT
POW	4	GND		DTR	4	OUT
OUT	5	RD		GND	5	
IN	6	SD		DSR	6	IN
OUT	7	CTS		RTS	7	OUT
IN	8	RTS		CTS	8	IN
				RI	9	IN

Fig. 6-49. Block Diagram for the Dual Modem RJ-232 Rear Plug Assembly.

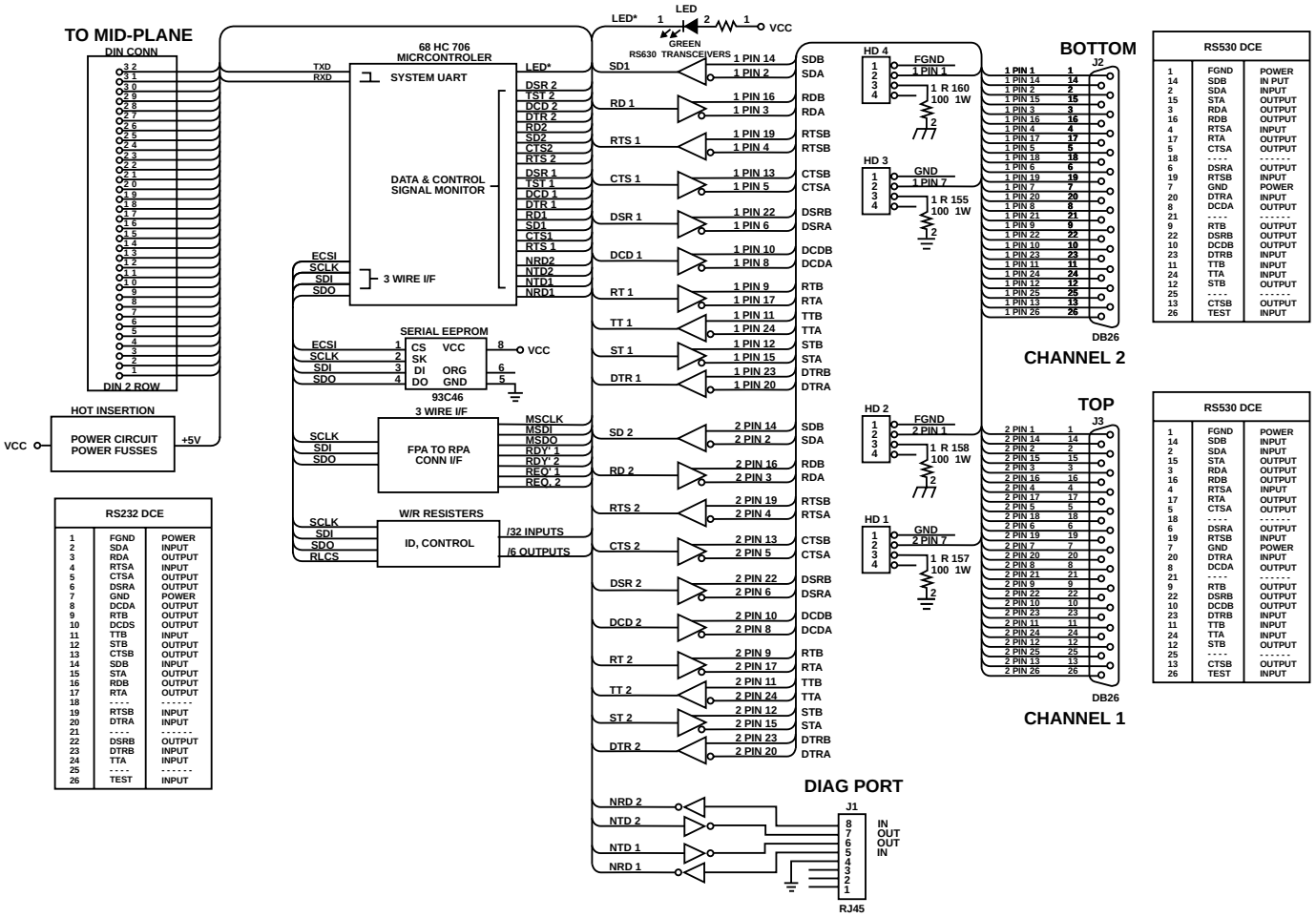


Fig. 6-50. RS-530 Block Diagram for DMC Rear Plug Assembly.

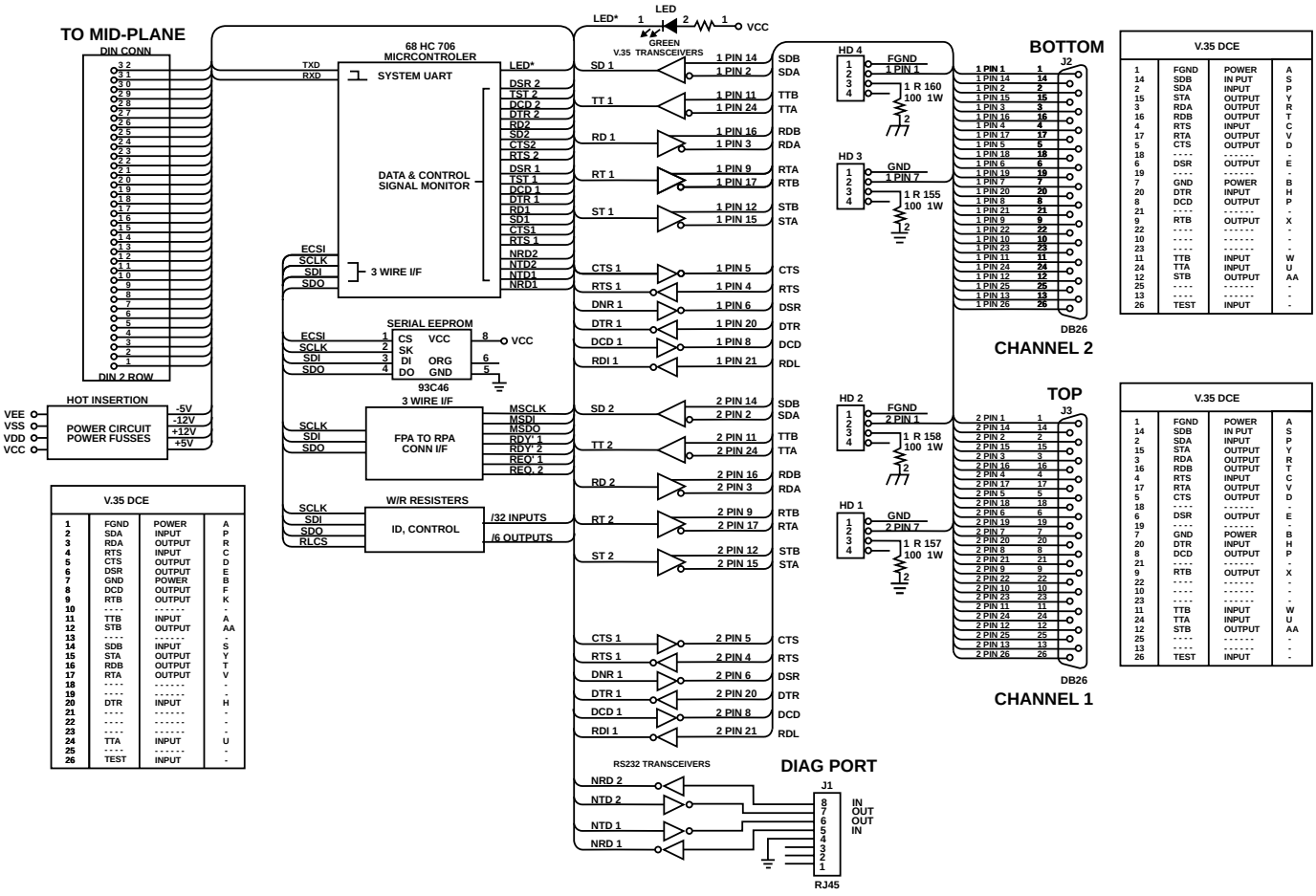


Fig. 6-51. Block Diagram for the DMC V.35 Rear Plug Assembly.

7. Plug-In Card Installation

Front plug-in cards are referred to as Front Plug Assemblies (FPAs), and rear plug-in cards are called Rear Plug Assemblies (RPAs). You begin the card installation procedures with the front plug-in cards and power supply.

7.1 Power Supply Assemblies

1. Install AC or DC power cord and -48 V power and ring voltage cable as required. For examples, refer to **Figure 5-6, 5-7**, or **5-10**.
2. Install the power supply front plug assembly into the center slot position.
3. Install the cards as required. (The T1, HSD, PCM, etc.)
4. Turn on the power switch at the back of the multiplexer shelf.
5. Check to see if the four power LEDs are on. This indicates that voltages are present.

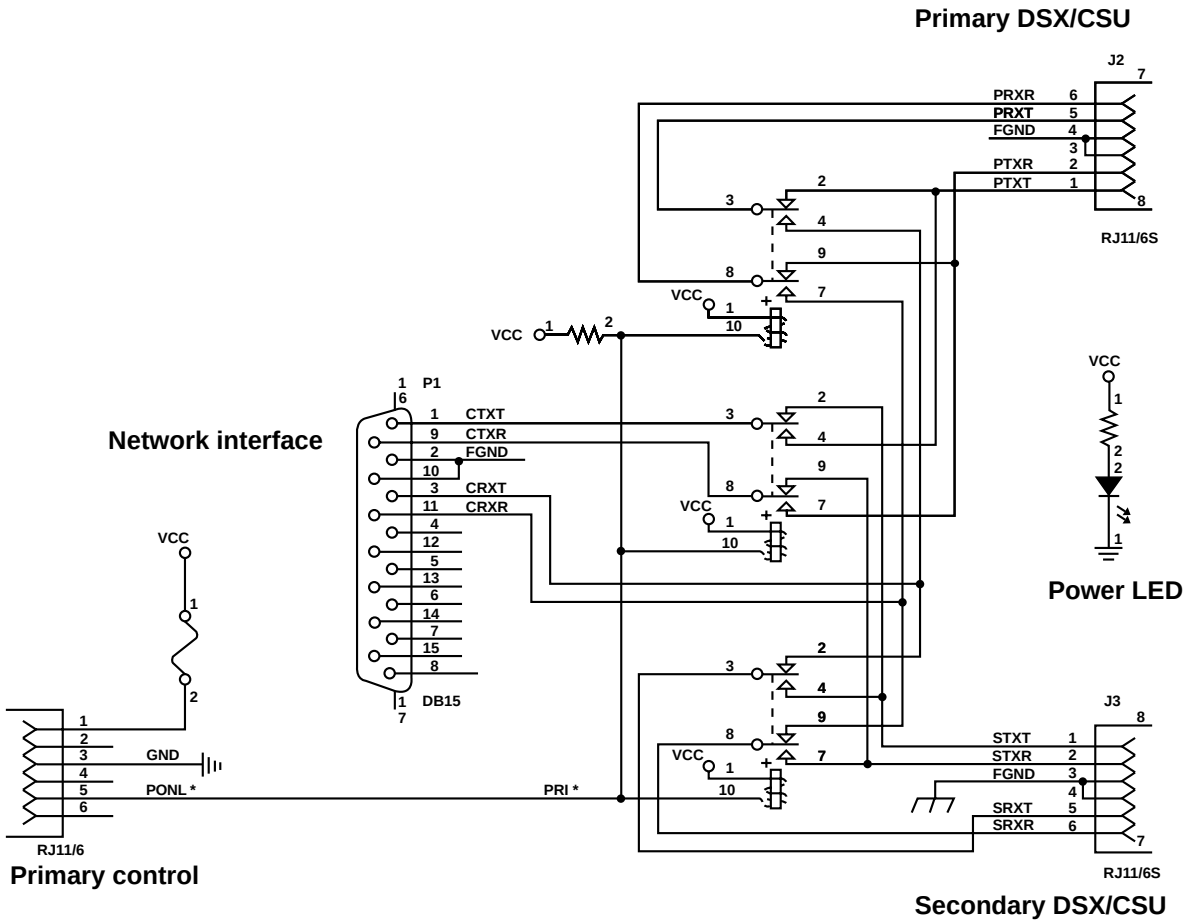


Fig. 7-1. Block Diagram for the Relay Card.

7.2 Network Management Assemblies

MCC Front Plug Assembly (MT442C)

Refer to **Fig. 6-39** for assembly layout.

1. Set DIP switches on this card. Switch 1 and 2 are used. See **Fig. 6-39**. JP1 is factory set at 1-2.
2. Install the MCC front plug assembly into slot 14. Any slot will work, but position 14 is recommended.

MCC Rear Plug Assembly (MT443C)

Refer to **Fig. 6-43** for assembly layout.

1. Install rear plug assembly into the slot mated with the MCC front plug assembly.
2. Connect VT100 or VT52 terminal up to the DB9 pin connection, DCE. If you are using a modem, connect the cable up to the DTE connection. The RJ-45 is used with the Penril Series 6000 Network Management System.

7.3 T1 Logic Assemblies

T1 Logic Front Plug Assembly (MT440C)

Refer to **Fig. 6-7** for assembly layout.

1. Set header: HD3 - Smart/dumb mode. Pins 1 and 2 are MCC-controlled (smart mode).
2. For dumb mode, install T1 logic front plug in slot 7 for the East T1 and into slot 8 for the West T1. Refer to **Table 7-1** for shelf slot positions in the dumb mode.
3. For smart mode, install front plug in any slot.

Table 7-1. Shelf Slot Positions.

Shelf slot position													
EAST T1								WEST T1					
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	5	9	13	17	21	*	*	1	5	9	13	17	21
2	6	10	14	18	22	*	*	2	6	10	14	18	22
3	7	11	15	19	23	*	*	3	7	11	15	19	23
4	8	12	16	20	24	*	*	4	8	12	16	20	24

* Slots for T1 Logic card

NOTE

Table 7-1 shows all possible channel assignments. An actual installation would have either East or West channels assigned.

T1 Logic DSX-1 Rear Plug Assembly (MT441C)

Refer to **Fig. 6-9** for assembly layout.

1. Install rear plug assembly in the slot matching with front T1 logic card.

T1 Logic CSU Rear Plug Assembly (MT465C)

Refer to **Fig. 6-10** for assembly layout. Install rear plug assembly in the slot matching with front T1 logic card.

7.4 Voice Assemblies

Quad PCM Voice Front Plug Assembly (MT445C)

Refer to **Fig. 6-12** for assembly layout.

1. Set header: HD1 set to 2-3 dumb mode; 1-2 smart mode (MCC controlled)
2. For dumb mode, install front plug assembly in slot #1-6 or 9-14. See **Table 7-1**.
3. For smart mode, install front plug into any slot.

Quad 4-Wire E&M Rear Plug Assembly (MT446C)

Refer to **Fig. 6-17** for assembly layout.

1. Set headers: HD1 factory set to 1-2 and 3-4, which are both shorted.
2. Install rear plug assembly into the slot matching the front quad PCM voice card.

Quad 2-Wire FXS Rear Plug Assembly

Refer to **Fig. 6-22** for assembly layout.

1. Check switch positions. Refer to table in **Fig. 6-22**.
2. Install rear plug assembly into the slot matching the front quad PCM voice card.

Quad 2-Wire FXO Rear Plug Assembly (MT448C)

Refer to **Fig. 6-24** for assembly layout.

1. Set headers: HD1 through HD4 set to 1-2 (900 ohms) and 2-3 (600 ohms); HD5 and HD6 set to 1-2 (ground start mode) and 2-3 (loop start mode).
2. Install rear plug assembly in the slot mated with the front plug assembly quad PCM voice card.

Quad 4-Wire AD Rear Plug Assembly

Refer to **Fig. 6-25** for assembly layout.

1. Install rear plug assembly in the slot mated with front plug assembly quad voice card.

7.5 Data Assemblies

High-Speed Data Front Plug Assembly (MT450C)

Refer to **Fig. 6-28** for assembly layout.

1. Set headers: HD2 is set to 2-3; HD3 is set to 2-3.
2. Install front plug assembly into any slot. (Dumb mode is not supported when using this card.)

High Speed Data Rear Plug Assemblies

Refer to **Fig. 6-32** and **6-33** for assembly layout.

1. Install rear plug assembly into the slot mated with the high speed data front plug assembly. The rear plug assemblies include the V.35, RS-232, and RS-530 (MT451C, MT452C, MT453C). The RS-232 speed is limited to 56 or 64 Kbps.

Dual Data Card Front Plug Assembly (MT470C)

Refer to **Fig. 6-30** for assembly layout.

1. Set header: HD3 is set to 1-2.
2. Install front plug assembly in any slot.

Dual Data Card Rear Plug Assemblies (MT471C, MT472C, MT473C)

Refer to **Fig. 6-31** for assembly layout.

1. Set headers: HD1 and HD3 are set to 3-4; HD2 and HD4 are set to 1-2.
2. Install in slot mated with DDC front card. The rear plug assemblies include the V.35, RS-232, and RS-530.

Subrate Dual Data Card Front Plug Assembly

Refer to **Fig. 6-32** for assembly layout.

1. Set HD1 to 1-2.
2. Install in the slot mated with OCU-DP.

Office Channel Unit Data Port RPA (MT476C)

Refer to **Fig. 6-38** for assembly layout.

1. Install rear plug assembly in the slot mated with the dual data front card.

Dual Modem Front Plug Assembly (MT482C)

Refer to **Fig. 6-44** for assembly layout.

1. Install front plug assembly into any slot.

Dual Modem Rear Plug Assemblies

Refer to **Figures 6-46** and **6-47** for assembly layouts.

1. Set headers for RS-232, RS-530 and V.35 cards: HD1 and HD3 are set to 1-2; HD2 and HD4 are set to 3-4. For the RJ-232 card, set HD1 to 1-2 and set HD2 to 1-2.
2. Install rear plug assembly into the slot mated with the dual modem front plug assembly. The rear plug assemblies include the V.35, RS-232, RJ-232 and RS-530. The RS-232 speed is limited to 56 or 64 Kbps.

8. Configuring the Network

8.1 Overview of MCC Control Screens

The MCC (Monitor, Control, and Configuration) operating system generates menu screens for operating the T1 Channel Bank. Use **Fig. 8-1** as a reference guide or map to reach other screens. Refer to **Chapter 9** for more detailed information about each of the security levels and using the menus. There is more detailed information in **Chapter 10** about configuring the plug-in cards mentioned in **Chapter 7**.

The main topics covered in this chapter are—

- Overview of the MCC system map
- Screens available to operator by security level
- Main Menu and its sub-menus selected from the Main Menu
- 8 sub-menus reached through the System Functions Menu

Basic screen usage—

- The screens permit keyboard control to activate loopbacks and change selectable options.
- The test icon appears in the lower left screen any time that any channel is placed in loopback or test.
- The alarm icon appears in the lower right screen any time that an alarm is detected.

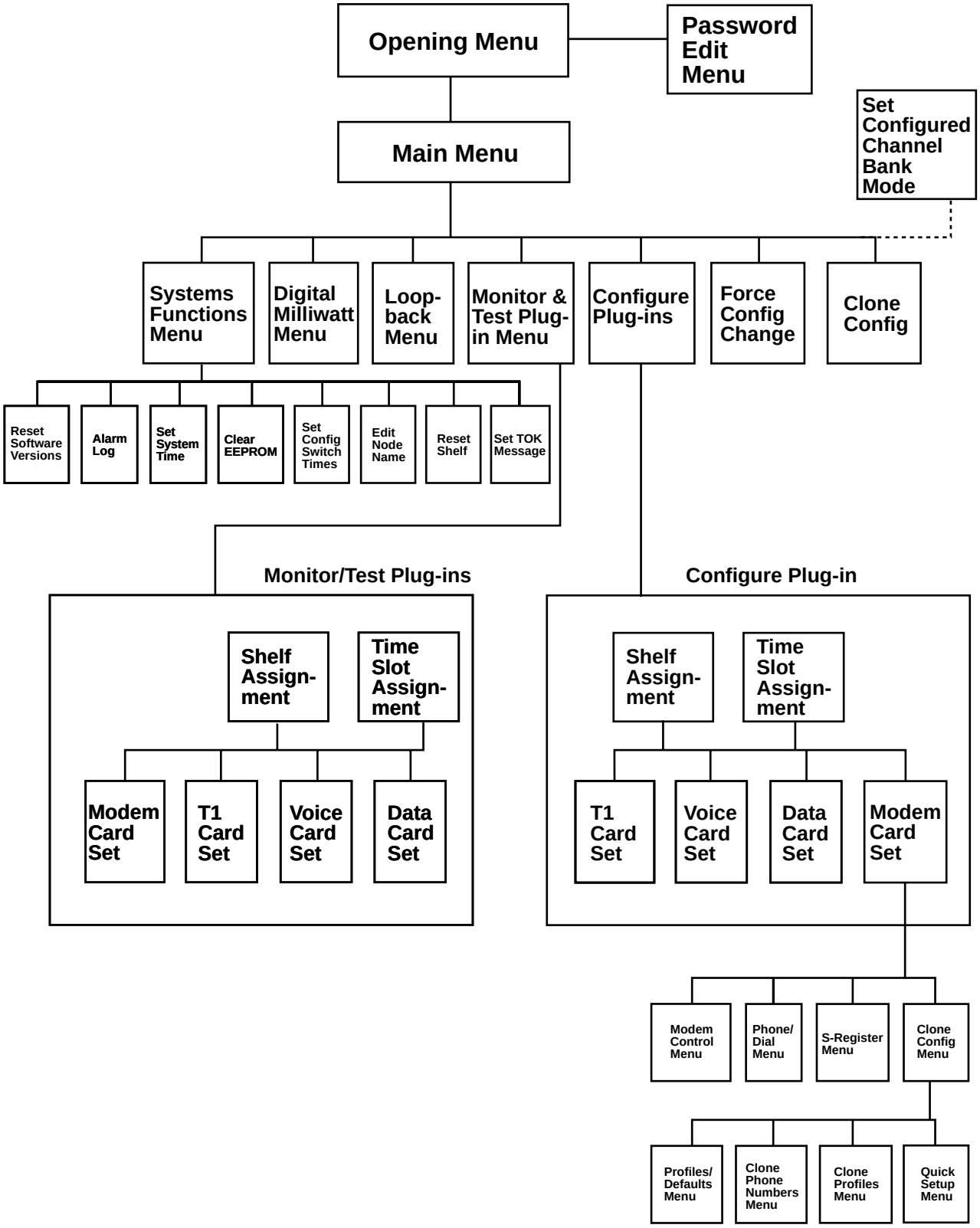


Fig. 8-1. MCC System Map to Available Menus.

Table 8-1. Available MCC Menus by Security Level.

Security Level MENUS	Security Levels 1	2	3	4
1 Opening menu	Y	Y	Y	Y
2 Password edit menu	N	N	N	Y
3 Main menu	Y	Y	Y	N
4 Force configuration change	N	N	Y	N
5 System functions menu	Y	Y	Y	N
6 Digital milliwatt menu	N	Y	Y	N
7 Loopback menu	N	Y	Y	N
8 Select configure menu	N	N	Y	N
9 Monitor/test plug-ins	N	N	Y	N
10 Configure plug-ins	N	N	Y	N
11 Configure shelf plug-in assignments	N	N	Y	N
12 Set network name	N	N	Y	N
13 Set configure switch times	N	N	Y	N
14 View alarm log	Y	Y	Y	N
15 Read software versions	Y	Y	Y	N
16 Set system time	N	N	Y	N
17 Clear EEPROM	N	N	Y	N
18 Reset shelf	N	N	Y	N
19 Set TOK	N	N	Y	N
20 Clone	N	N	Y	N
21 Set configured channel bank mode	N	N	Y	N

8.2 Power Up and Opening Menu

1. Connect a VT100 or VT52 terminal to the DCE port on the rear of the MCC card.

2. Set switches on the MCC front card.

3. After turning on the system, press the Enter key. The opening screen appears. See **Fig. 8-2** for the screen example.

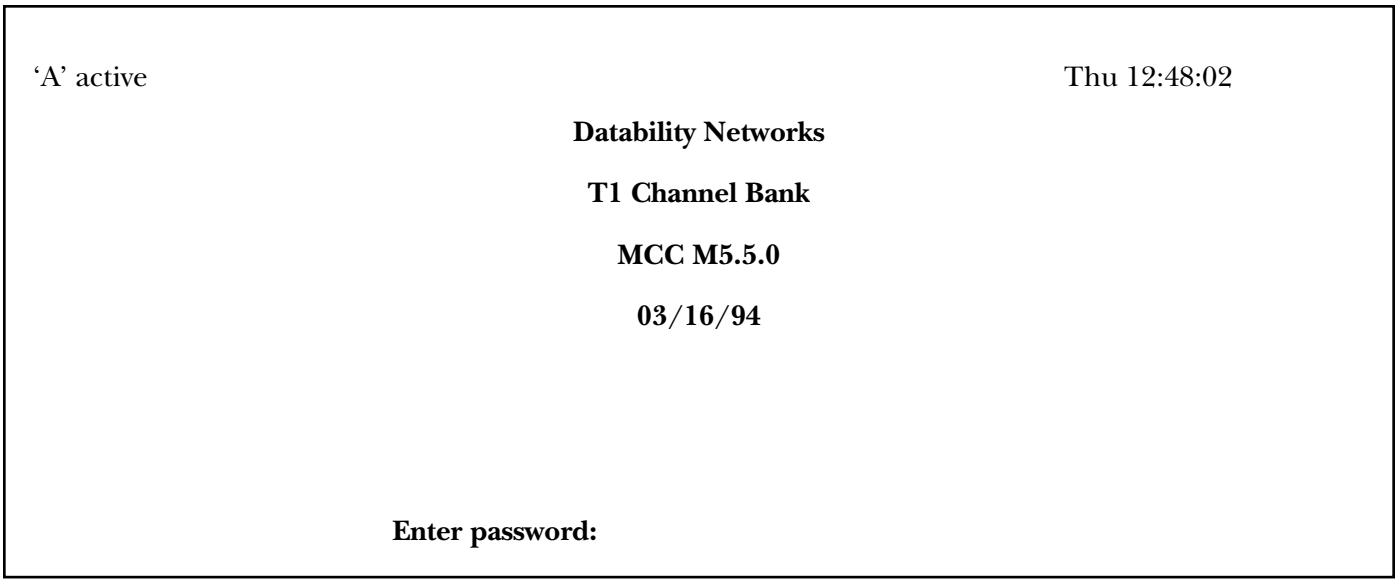


Fig. 8-2. Opening Menu.

4. Initially, enter THE MASTER to go to the Password Edit Menu. The MCC is shipped with this default password: THE MASTER. You must use all upper-case letters. Refer to **Chapter 9** for more security-level information and using the various menus. If you decide to change the password from the factory default, you must write it down somewhere. If you forget the new password, there is no way to find out through the system what the new password is. A new MCC would have to be installed.

5. Enter passwords for the security level you need, such as 1, 2, 3.

- Level 1 password has one function: system functions.
- Level 2 password has three functions: system functions, loopback menu, and digital milliwatt.

- Level 3 password includes the functions listed on the main menu shown in **Fig. 8-3**.
- THE MASTER is the key to the Password Edit Menu, which uses a level 4 security in order to set or edit levels 1 through 4 passwords.

6. Press esc to exit the password menu and return to the opening menu.
7. Enter a password and Enter to reach the menu you want (see **Table 8-1**). For example, entering 3 will take you to the main menu.

8.3 Main Menu

This is the main routing menu that lets you select (a route) to the other menus. The display you see will depend on the type security level that has been set up. See **Chapter 9** for more information on security levels and how to use the other menus. The main menu lists the menu selections available to the operator. For example, depending on the password you type in on the opening menu, you will reach menus with the functions: in **Fig. 8-3:**

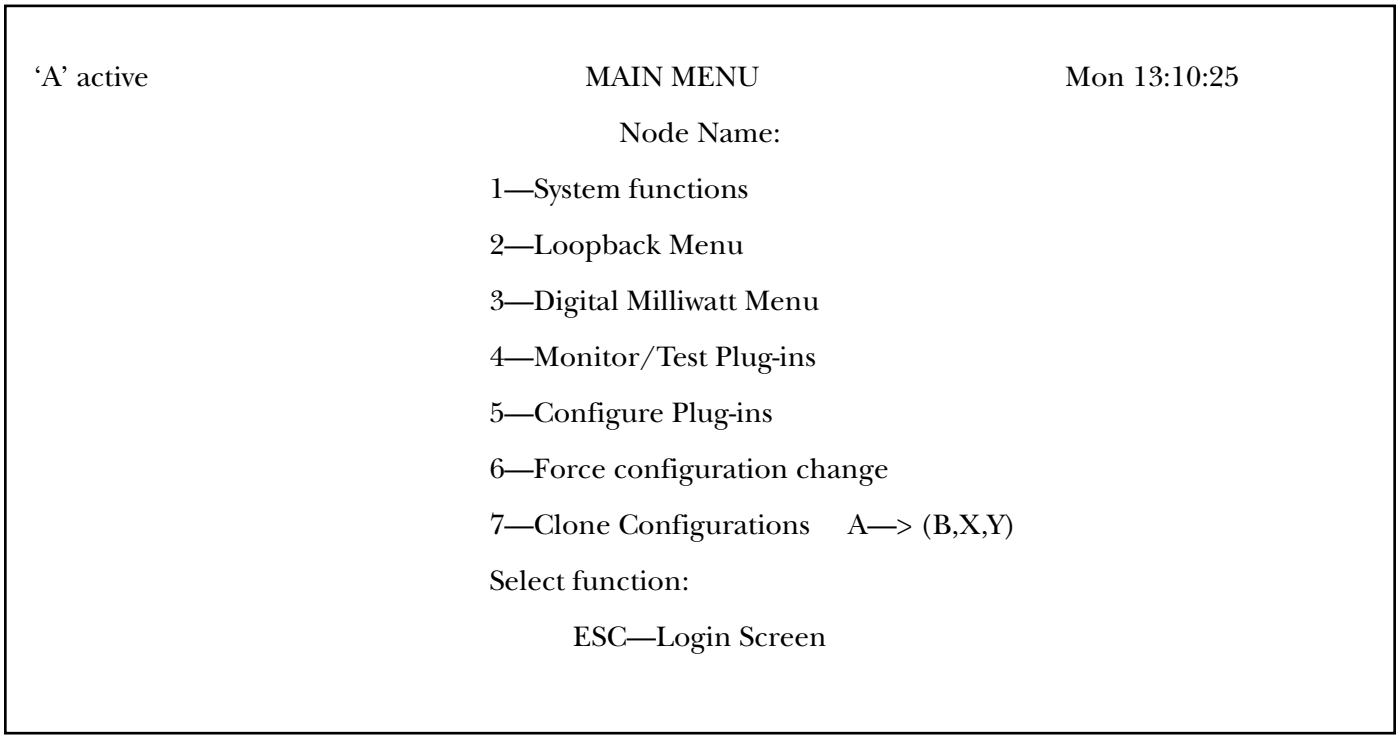


Fig. 8-3. Main Menu.

When you are in the main menu, you can select the sub-menus such as the monitor/test plug-ins. For example, the monitor/test plug-ins menu allows the operator to select a plug-in card to obtain configuration data, control loopbacks, and to see the T1 plug-in's performance on the T1 line. It does not permit configuration changes.

The sub-menus are presented in this manual in the order in which they appear on the main menu screen with the corresponding numbers of the main menu.

8.3.1 1— Systems Functions Menu

This menu displays choices such as viewing the alarm log or the software version number. See **Fig. 8-4**.

The screens and descriptions of the 8 sub-menus from the System Functions Menu are on the following pages.

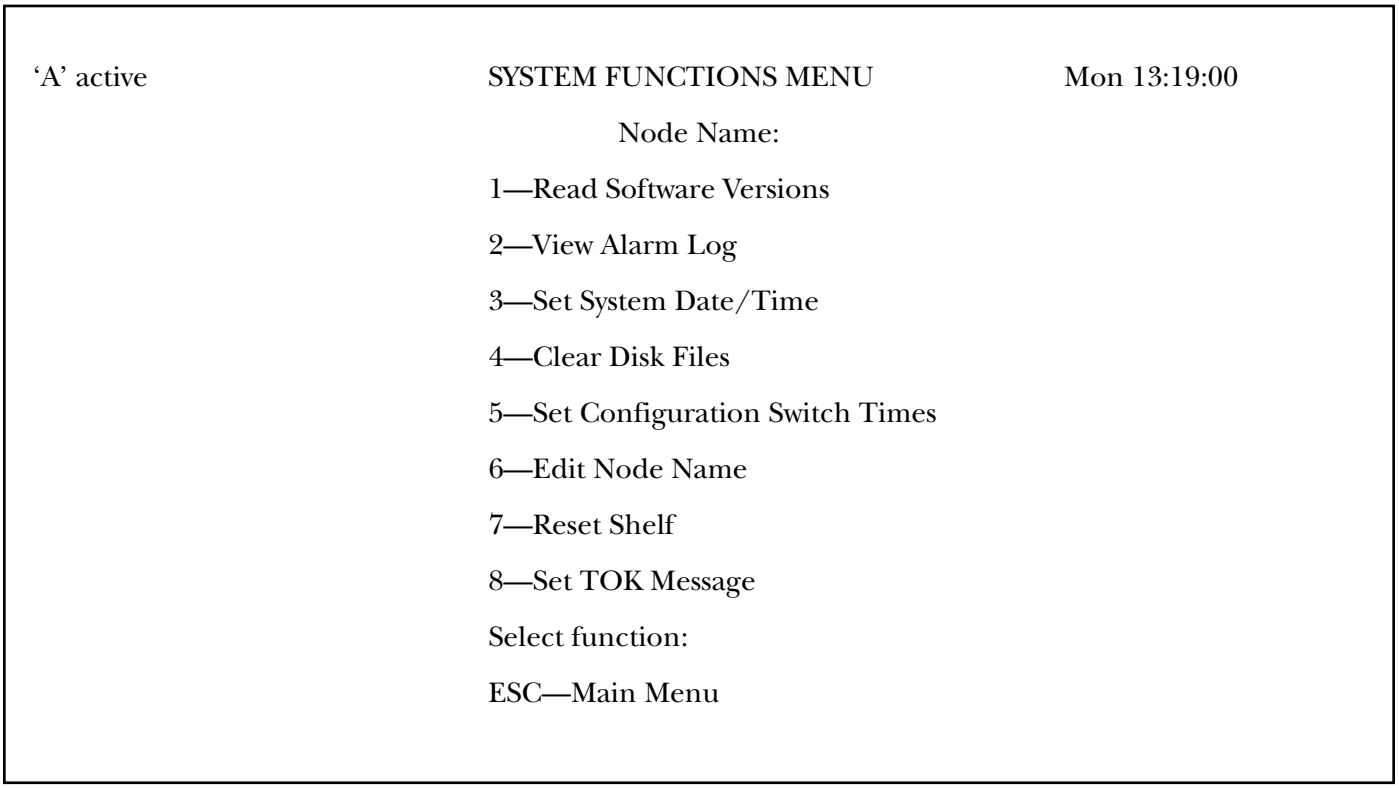


Fig. 8-4. System Functions.

(1) Read Software Versions

This menu identifies the software version on each card in the chassis.

See **Fig. 8-5**.

'A' active SHELF SOFTWARE VERSIONS Thu 12:39:06

Shelf 1 Node Name:..... Shelf 2

Slot FPA	Software	Date	Slot FPA	Software	Date
1 MCC	M5.5.0	03/16/94	1		
2 HSD	T5.3.0	01/04/94	2		
3			3		
4 HSD	T3.3.6	09/30/92	4		
5 DDC	D5.3.0	01/04/94	5		
6 PCM	T3.2.3	05/19/92	6		
7 T1	T5.3.0	01/04/94	7		
8 T1	T3.3.6	09/30/92	8		
9 T1	T5.3.0	01/04/94	9		
10 SDDC	D5.4.0	03/07/94	10		
11 DMC	Z5.3.0	02/07/94	11		
12 DMC	Z5.3.0	01/04/94	12		
13 DMC	Z5.5.0	03/15/94	13		
14			14		

Fig. 8-5. Read Software Versions.

(2) Alarm Log

When you select this option, a list of the most recent alarms will be displayed. See **Tables 10-1** and **10-2** for lists of alarms and their meanings.

'A' active ALARM LOG Mon 13:19:25

Mode Name:

Time	Slot	FPA	RPA	Port	Class	Event	Description
13:09:42	15	MCC	MCCNET	00	A	CLA	Major Alarm Cleared
13:09:42	15	MCC	MCCNET	00	1	CRS	Card Reset

C—Clear Alarm Log ESC—Previous Menu

Fig. 8-6. Alarm Log.

Fig. 8-7 shows that a test-mode condition has been detected in the system.

'Y' active ALARM LOG Mon 13:20:54

Mode Name:

Time	Slot	FPA	RPA	Port	Class	Event	Description
13:20:47	08	T1	CSU	NA	A	CLA	Major Alarm Cleared
13:20:34	08	T1	CSU	NA	E	TON	Test Mode On
13:20:25	08	T1	CSU	NA	A	BLU	BLUE Alarm Condition
13:20:25	08	T1	CSU	NA	M	TPA	Trunk Processing Alarm
13:20:23	07	T1	DSX1	NA	E	TON	Test Mode On
13:20:14	07	T1	DSX1	NA	A	CLA	Major Alarm Cleared
13:20:13	08	T1	CSU	NA	A	CLA	Major Alarm Cleared
13:20:03	14	PCM	4W E&M	06	M	CKS	Checksum Failure
13:20:03	13	HSD	RS232	NA	M	CKS	Checksum Failure
13:20:02	07	T1	DSX1	NA	A	YEL	YELLOW Alarm Condition
13:20:01	08	T1	CSU	NA	A	RED	RED Alarm Condition
13:20:01	08	T1	CSU	NA	M	TPA	Trunk Processing Alarm
13:20:00	07	T1	DSX1	NA	E	TOF	Test Mode Off
13:20:00	15	MCC	MCCNET	00	M	CAY	West T1 Failure—Switch to 'Y'

****
* TEST *
****

C—Clear Alarm Log ESC—Previous Menu

Fig. 8-7. Alarm Log (with TEST).

(3) Set System Time

When you first power up the T1 Channel Bank, the system clock may not correspond to the correct time for the time zone in which you live. The factory time setting is set according to Eastern Standard Time. You may need to change the time for a Daylight Saving Time setting. By using this menu choice, you can easily make these time changes.

Refer to **Fig. 8-8** for an example of this screen. The top line shows the current time that is programmed. The next line is the edit line, where you can type in a new time setting. As you type in the new time, you will need to add the colon in order for the system to accept the time change.

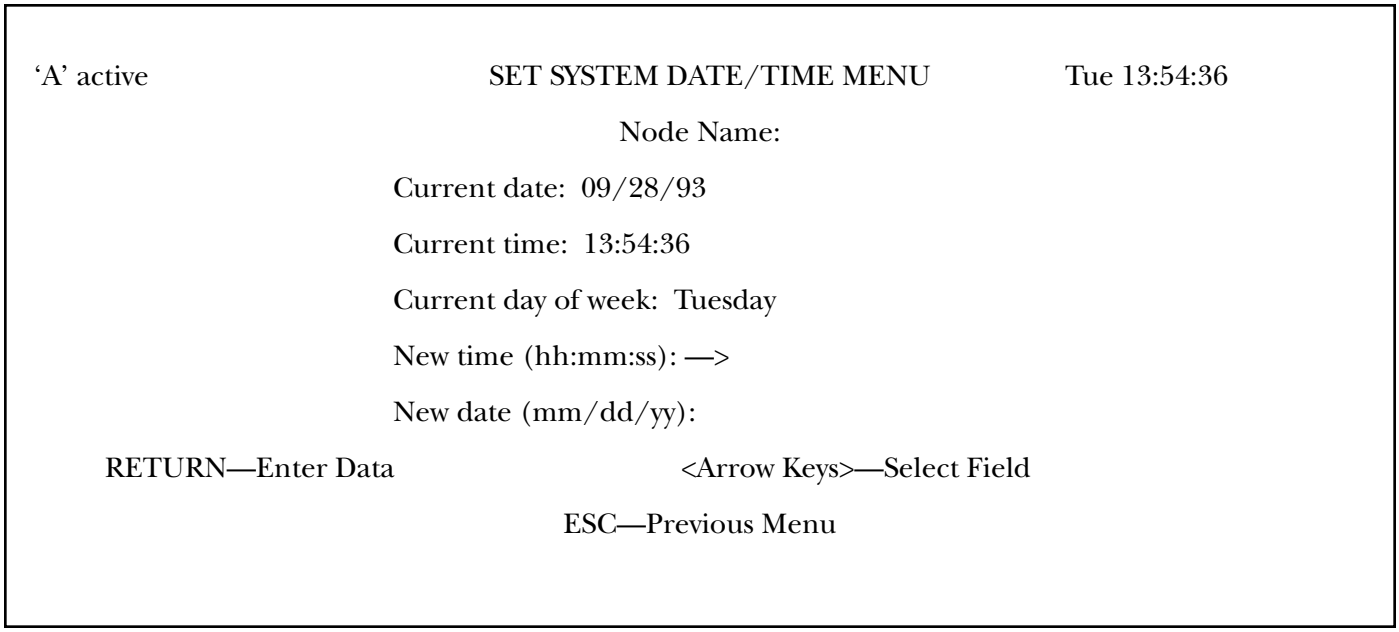


Fig. 8-8. Set System Time Menu.

(4) Clear EEPROM

When you choose 4 from the system functions menu, the question, "Clear EEPROMS?" and "Are you sure?" appears. Enter Y or N. If you choose Y, all configurations will be erased except the password, "THE MASTER".

(5) Set Configuration Switch Times

This menu allows you to select the time of day for a configuration switch. The system may be programmed to switch from configuration "A" to configuration "B" and from "B" to "A" at any time within a 24 hour period. Off in this position disables the switch times. See **Fig. 8-9**.

'A' active SET CONFIGURATION SWITCH TIMES MENU Tue 13:54:59

Node Name:

			Mon-Fri	Sat-Sun
Switch to A configuration at:	(Off/hh:mm:ss)	—>	Off	Off
Switch to B configuration at:	(Off/hh:mm:ss)		Off	Off

RETURN—Enter Data <Arrow Keys>—Select Field

ESC—Previous Menu

Fig. 8-9. Set Configuration Switch Times.

(6) Edit Node Name

Type in the name of the node and press Enter. You can enter only one name with a limit of 10 characters each time you use this menu.

(7) Reset Shelf

Option 7 resets all the cards in the chassis.

(8) Set TOK Message Menu

Set the TOK (Time Of acknowledgment) message (1 second to 59 minutes 59 seconds) through the NMS. See **Fig. 8-10**. The TOK message informs the NMS of the status of the T1 Channel Bank.

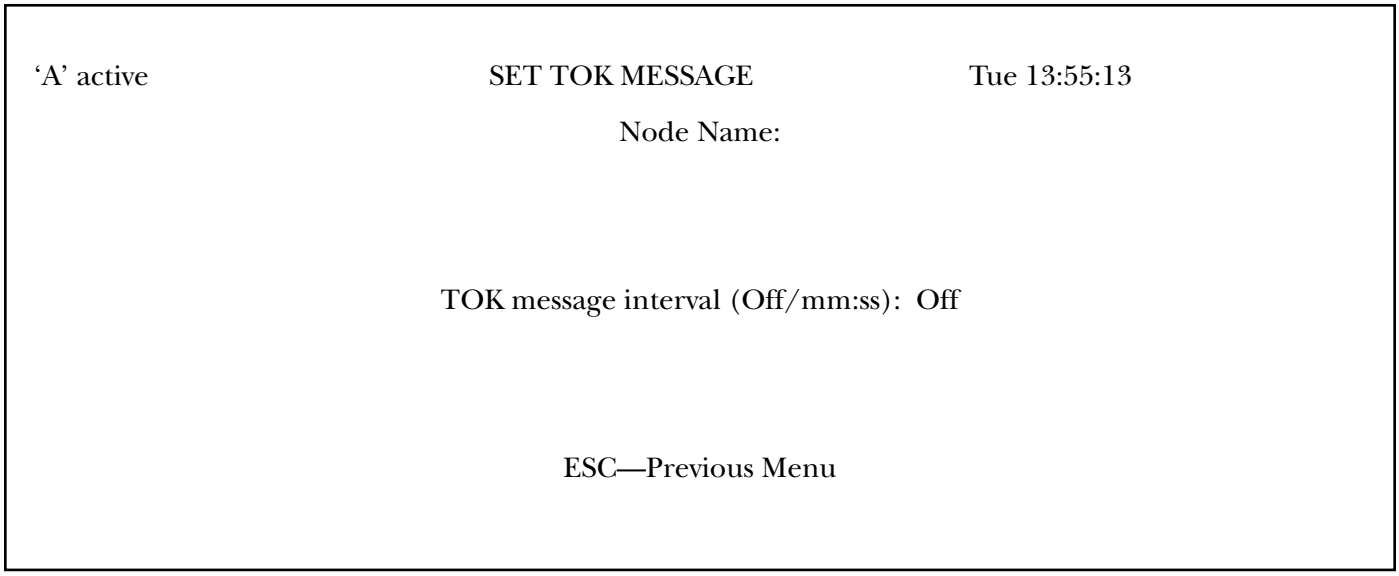


Fig. 8-10. Set TOK Message Menu.

The TOK is an NMS option, and an NMS is required to use the TOK. The time is displayed in minutes and seconds (mm:ss). The time interval will automatically appear on the terminal screens and automatically adjusts for leap year and for the correct day of the week.

If you want to enable the TOK message intervals, enter the time interval in minutes and seconds.

To disable the TOK message, enter OFF for the mm:ss only message. The TOK factory default is set to OFF unless it is connected to an NMS.

If the chassis fails, the TOK messages will stop. Then the NMS will report (alarm) that a problem exists.

8.3.2 2 — Loopback Menu

The loopback menu lists all time slots associated with the selected node (East T1 and West T1). See **Fig. 8-11.** You can put the channel into loopback by entering the T1 direction (E or W) and time slot number. For example, enter E01 for East time slot 1. You can put fractional data channels (that use more than one time slot) into loopback when you select any time slot within the set.

'A' active LOOPBACK MENU Tue 13:55:29

Node Name:

East Timeslots Loopback state				West Timeslots Loopback state			
E01	N	E13	N	W01	—	W13	—
E02	N	E14	N	W02	—	W14	—
E03	N	E15	N	W03	—	W15	—
E04	N	E16	N	W04	—	W16	—
E05	N	E17	N	W05	—	W17	—
E06	N	E18	N	W06	—	W18	—
E07	N	E19	—	W07	—	W19	—
E08	N	E20	—	W08	—	W20	—
E09	N	E21	—	W09	—	W21	—
E10	N	E22	—	W10	—	W22	—
E11	N	E23	N	W11	—	W23	—
E12	N	E24	N	W12	—	W24	—

Enter Timeslot (E1, W12, etc):

R—Reset all loopbacks ESC—Main Menu

Fig. 8-11. Loopback Menu.

How to Activate a Loopback Test

See **Fig. 8-11** for the loopback menu that shows the state of loopbacks in the East and West time slots. The MCC operator can use this menu to loopback any channel in the East or West T1. But the operator must specify which direction the loopback takes. For example, the selection is simply made by entering the time slot as E01 for East T1 or W01 for the West T1. Pressing the R key causes all loopbacks to be reset.

Since the high-speed data card can be configured for more than one time slot, any time slot in the set entered will result in the data card going into loopback. The display will indicate (Y) loopback on all channels in the set. See **Fig. 8-12** for loopback directions.

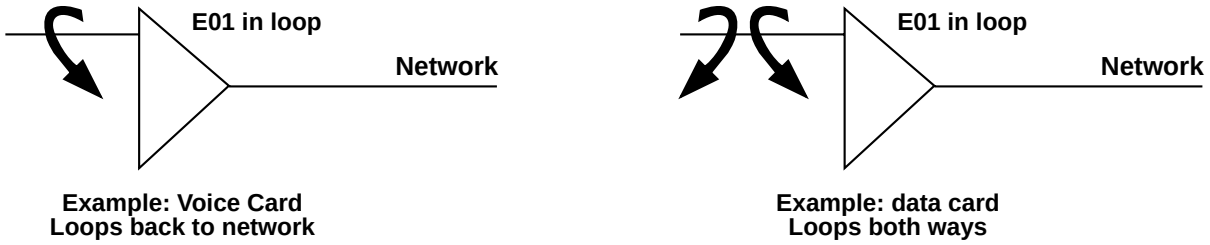


Fig. 8-12. Loopback Direction for Voice and Data Cards.

8.3.3 3 — Digital Milliwatt Menu

When you select a time slot in the digital milliwatt menu, you will send a digital milliwatt, which is a true DBM signal, a 1000 Hz tone. This overwrites the incoming data to the voice card with the digital milliwatt code. It functions well with 4-wire AD and 4-wire E & M, but not always with the loopstart or ground start. See **Fig. 8-13**.

'A' active LOOPBACK MENU Tue 13:55:29

Node Name:

East Timeslots Milliwatt state		West Timeslots Milliwatt state	
E01—Off	E13—Off	W01—Off	W13—Off
E02—Off	E14—Off	W02—Off	W14—Off
E03—Off	E15—Off	W03—Off	W15—Off
E04—Off	E16—Off	W04—Off	W16—Off
E05—Off	E17—Off	W05—Off	W17—Off
E06—Off	E18—Off	W06—Off	W18—Off
E07—Off	E19—Off	W07—Off	W19—Off
E08—Off	E20—Off	W08—Off	W20—Off
E09—Off	E21—Off	W09—Off	W21—Off
E10—Off	E22—Off	W10—Off	W22—Off
E11—Off	E23—Off	W11—Off	W23—Off
E12—Off	E24—Off	W12—Off	W24—Off

Fig. 8-13. Digital Milliwatt Menu.

How to Send Digital Milliwatt

See **Fig. 8-13** for the digital milliwatt menu that shows the state of digital milliwatt in the East and West time slots. The MCC operator can use this menu to implement digital milliwatt in any channel in the East or West T1. But the operator must specify which direction the digital milliwatt takes. See **Fig. 8-14**. For example, the selection is simply made by entering the time slot as E01 for East T1 or W01 for the West T1. Pressing the R key causes all cards to be reset.

Use digital milliwatt for voice only. The display will indicate (Y) on all channels in the set using the digital milliwatt code.

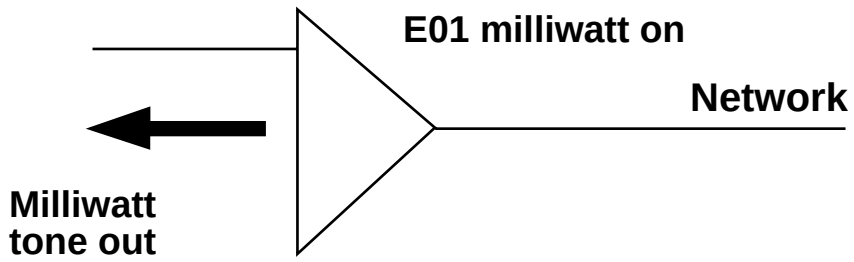


Fig. 8-14. Digital Milliwatt Direction.

8.3.4 4 — MONITOR/TEST PLUG-INS MENU

This menu displays status on the T1 line and permits activation of loopback. You also can monitor alarms and the number of bipolar violations (BPV) received. See **Fig. 8-15**.

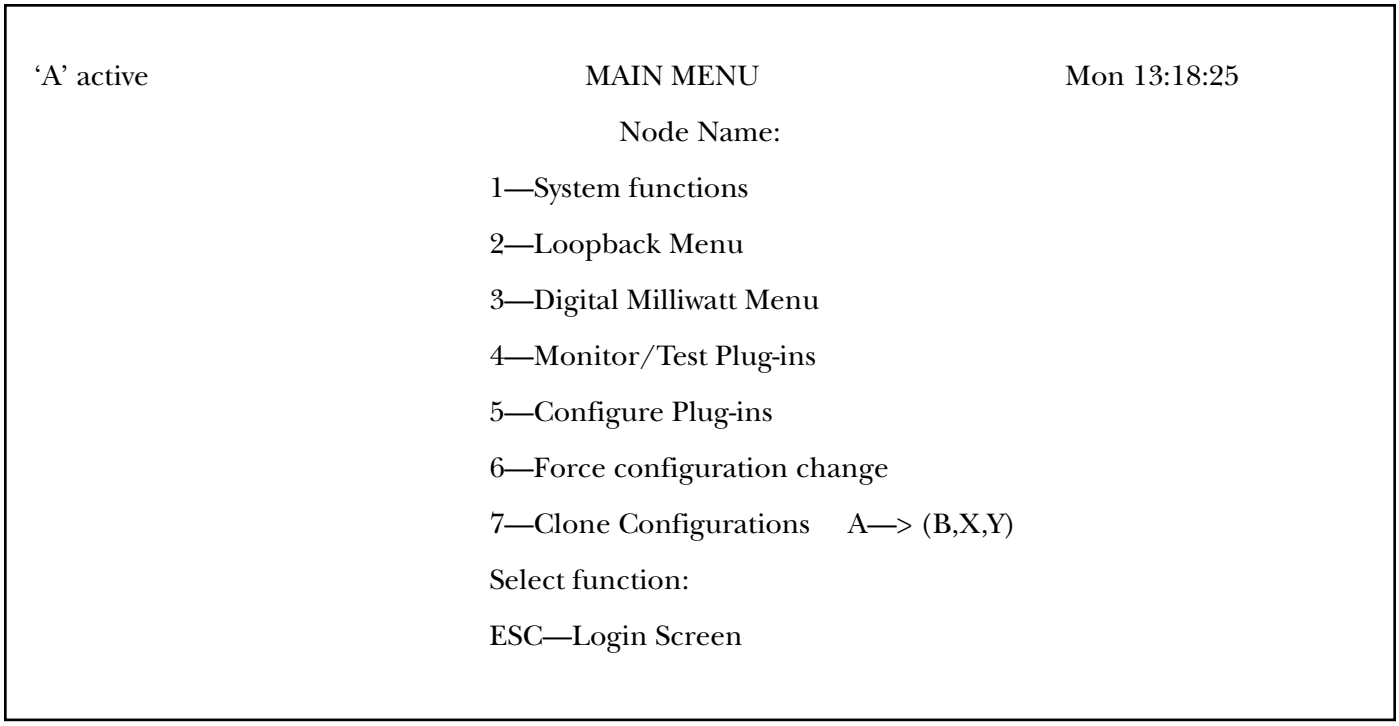


Fig. 8-15. Monitor/Test Plug-ins.

8.3.5 5 — Configure Plug-ins Menu

Enter the Configure Plug-ins menu from the main menu by typing 5 and pressing Enter. See **Fig. 8-16** and **Chapter 10** for more information on using these menus. The Configure Plug-ins menus consist of assignment menus that also allow access to plug-in card configuration menus for the T1 configuration, the quad PCM voice configuration, and the high-speed data card configuration.

'A' active CONFIGURE SHELF PLUG-IN ASSIGNMENTS Tue 13:39:33

'A' configuration

Shelf 1				Node Name:	Shelf 2				
Slot	FPA	RPA	Status	Timeslot	Slot	FPA	RPA	Status	Timeslot
1	MCC	MCCNET	Ok		1				
2					2				
3					3				
4					4				
5					5				
6					6				
7	SDDC	OCU	Ok	E 1 E 2	7				
8	T1	CSU	Ok	E Primary	8				
9	DDC	V35-A	Ok	E 3 E 4	9				
10	PCM	FX0	Ok	E 5 6 7 8	10				
11	HSD	V35-A	Ok	E 9-22	11				
12					12				
13	DMC	RJ232	Ok	E 23 E 24	13				
14					14				

Enter Shelf and Slot (1/12, etc.):

ESC—Main menu RETURN—View Timeslot Display

Fig. 8-16. Configure Plug-ins Menu.

8.3.6 6 — Force Configuration Change

Once you select one of the configurations from this menu, the system automatically sends a message to the other cards that causes a configuration switch to the newly chosen configuration. Then, the new choice—A, B, X, or Y—will be active. See **Fig. 8-17**.

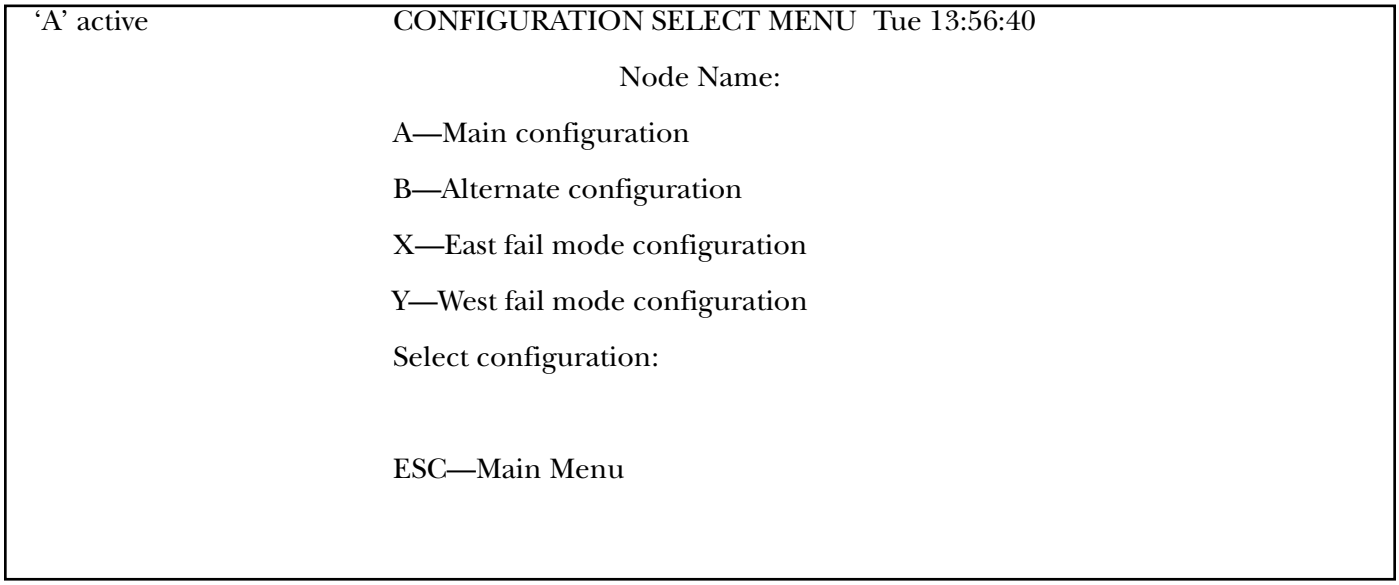


Fig. 8-17. Force Configuration Change.

8.3.7 7—Clone Configuration A—>(B, X, Y)

This option copies A to B, X, and Y automatically. See **Fig. 8-18**. Once you select 7 from the main menu, the screen will display: "Writing new configurations to shelf and EEPROM." You will observe the shelf number, MCC EEPROM information, and the circuit name(s).

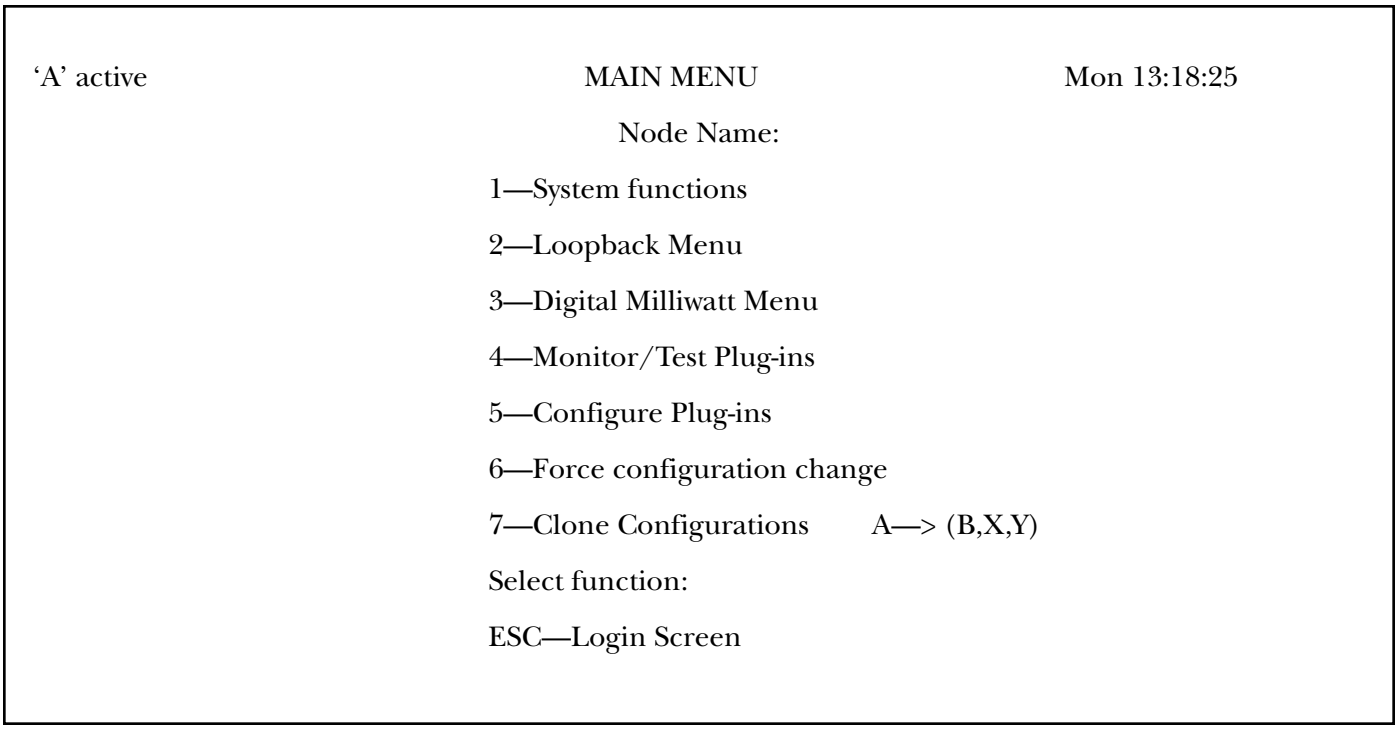


Fig. 8-18. Clone Configuration Selection.

8.3.8 8—Set Configured Channel Bank Mode

Select this option from the main menu to configure the T1 Channel Bank to operate in the A configuration without an MCC card installed. See **Fig. 8-19**.

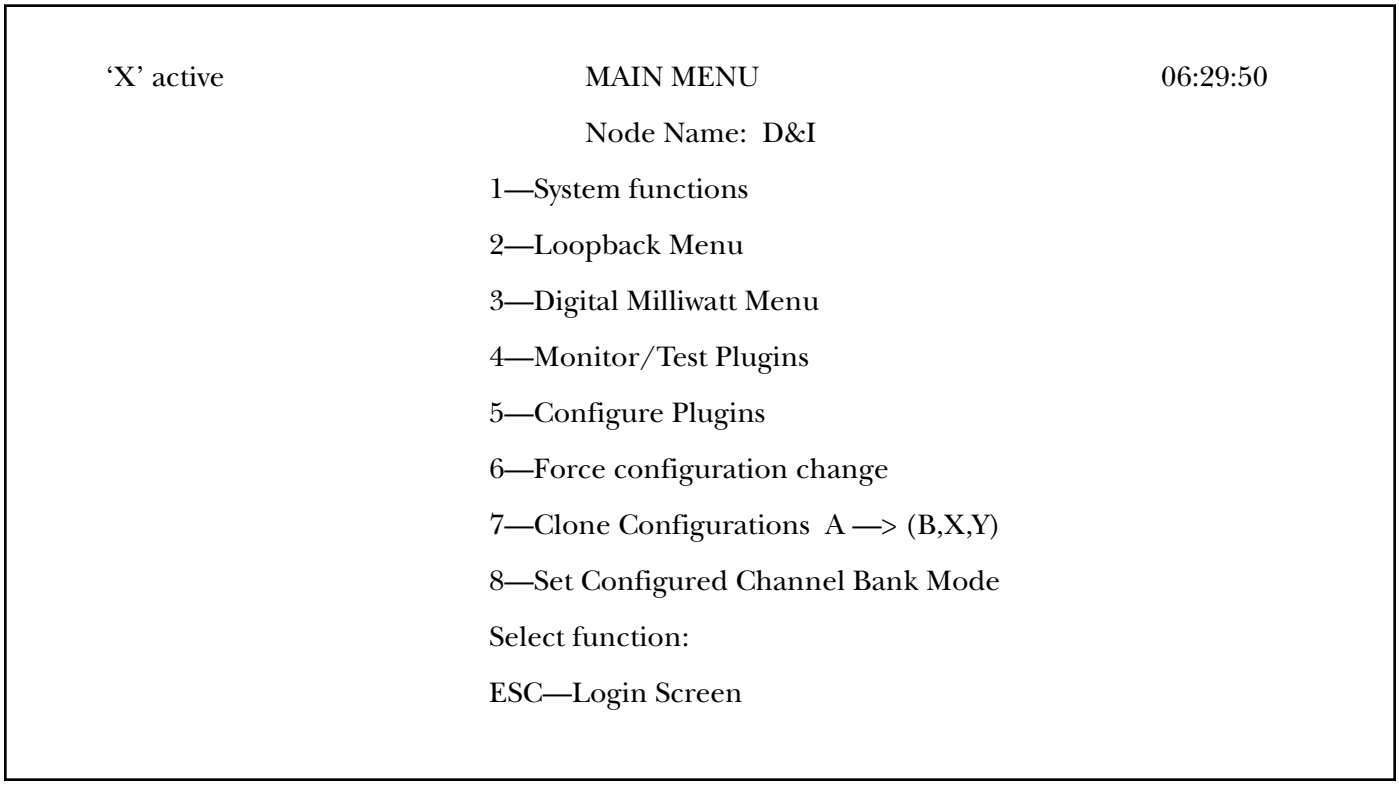


Fig. 8-19. Set Configured Channel Bank Mode Option.

9. Security Levels

The following four security levels (or functions) are available when a terminal is connected to the MCC either through a direct cable or a dial modem.

9. Level 4 Security

See **Fig. 9-1** for an overview of the MCC system and how to access Level 4 from the system "map."

A Level 4 security password gives the operator the ability to edit all passwords. When you turn on a new system, the default password is "THE MASTER." The Level 4 Password permits access to the Password Edit Menu. You can enter this menu from the opening screen by keying in THE MASTER at the prompt. Press the Enter key.

If you decide to change the passwords from the factory default, write them down for later reference. If you forget the new passwords, there is no way to find out through the system what those new passwords were. Call Technical Support if this happens.

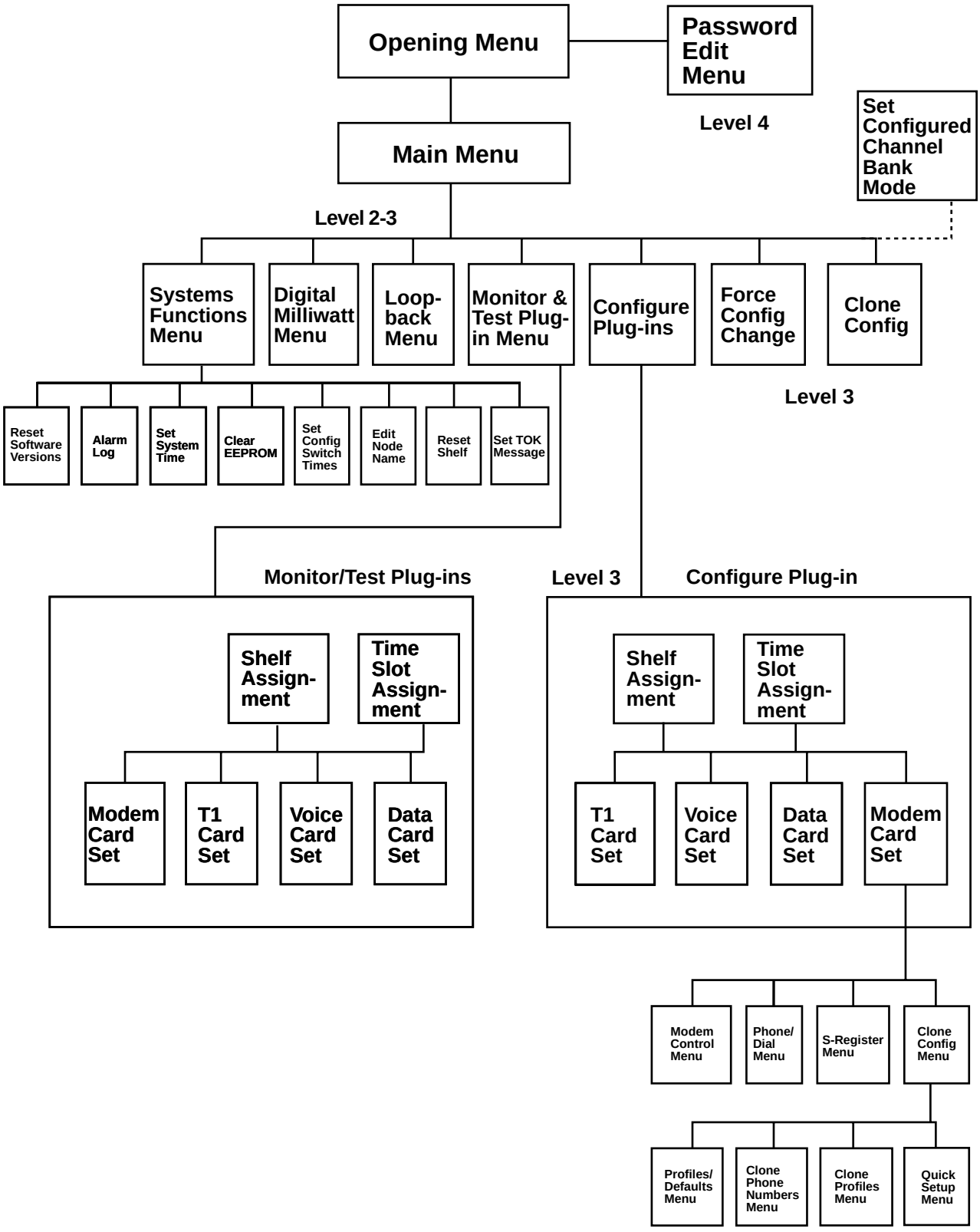


Fig. 9-1. Overview of Accessing Menus by Security Level.

Password Edit Menu

Refer to **Fig. 9-2** for a screen layout of the Password Edit Menu. Use this menu to set the password. Use the Enter key to scroll through Levels 1-4 and to place the cursor on a security level where you can edit the passwords with the keyboard. The letters you type in are case-sensitive, which means that upper and lower-case letters are treated as separate characters. A space is a valid character.

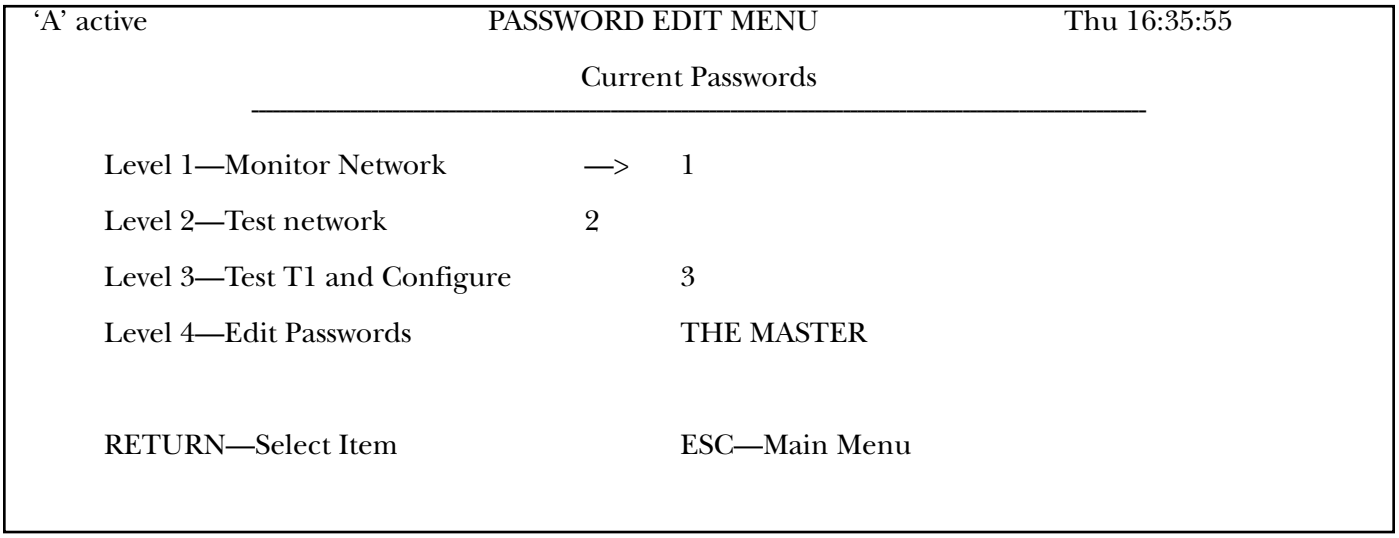


Fig. 9-2. Password Edit Menu.

9.2 Level 3 Security

See **Fig. 9-3** for the parts of the MCC system that are affected by level 3 security. Level 3 provides the full capability of the MCC except for password-edit functions.

This includes the ability to:

- Configure a plug-in
- Monitor and test a plug-in
- Activate loopbacks

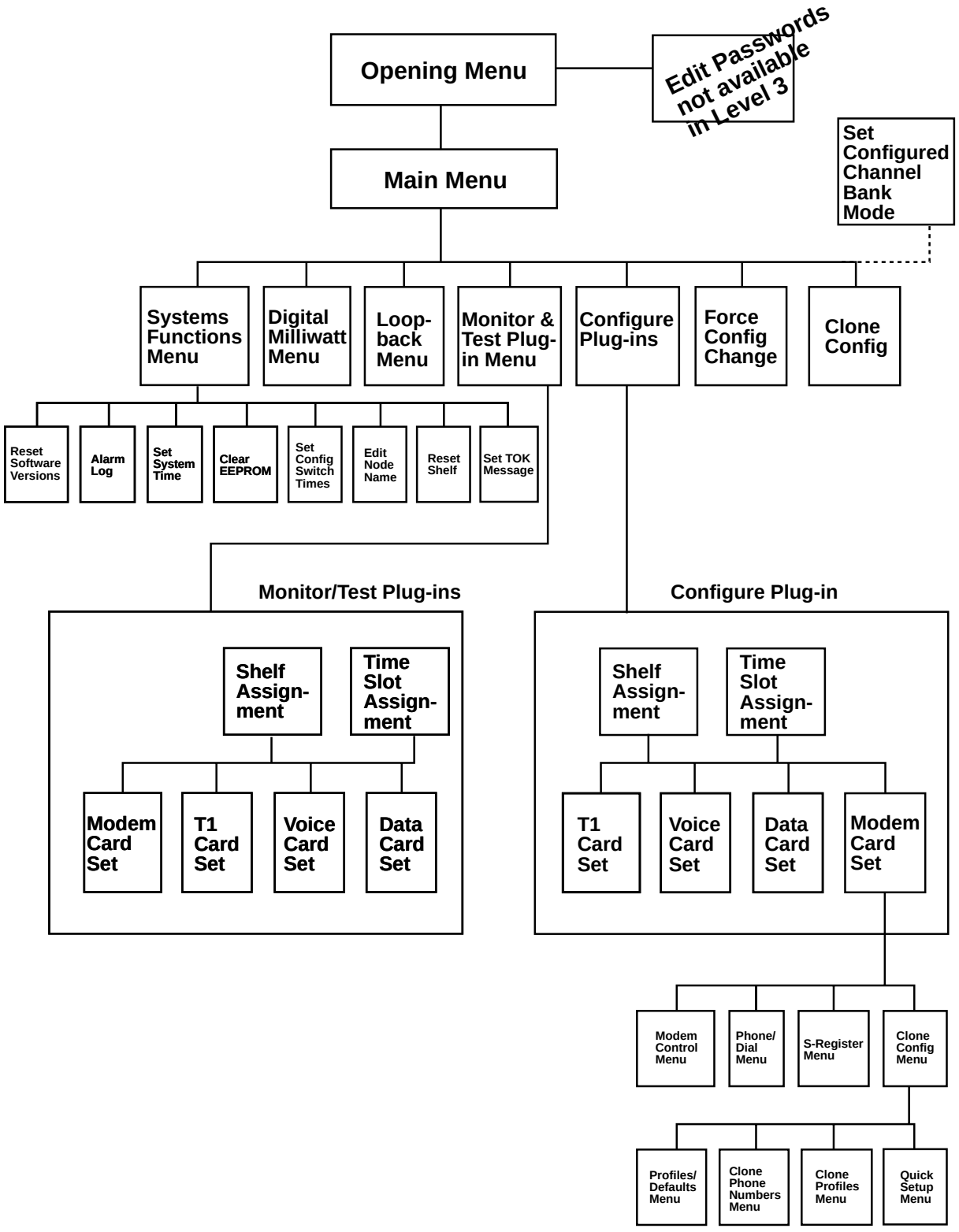


Fig. 9-3. Level 3 Security.

9.3 Level 2 Security

Refer to **Fig. 9-4** for the parts of the MCC system that are affected by Level 2 security. At Level 2 the master MCC can:

- View software versions
- View alarm log
- Perform loopbacks on channels
- Send digital milliwatts on all channels

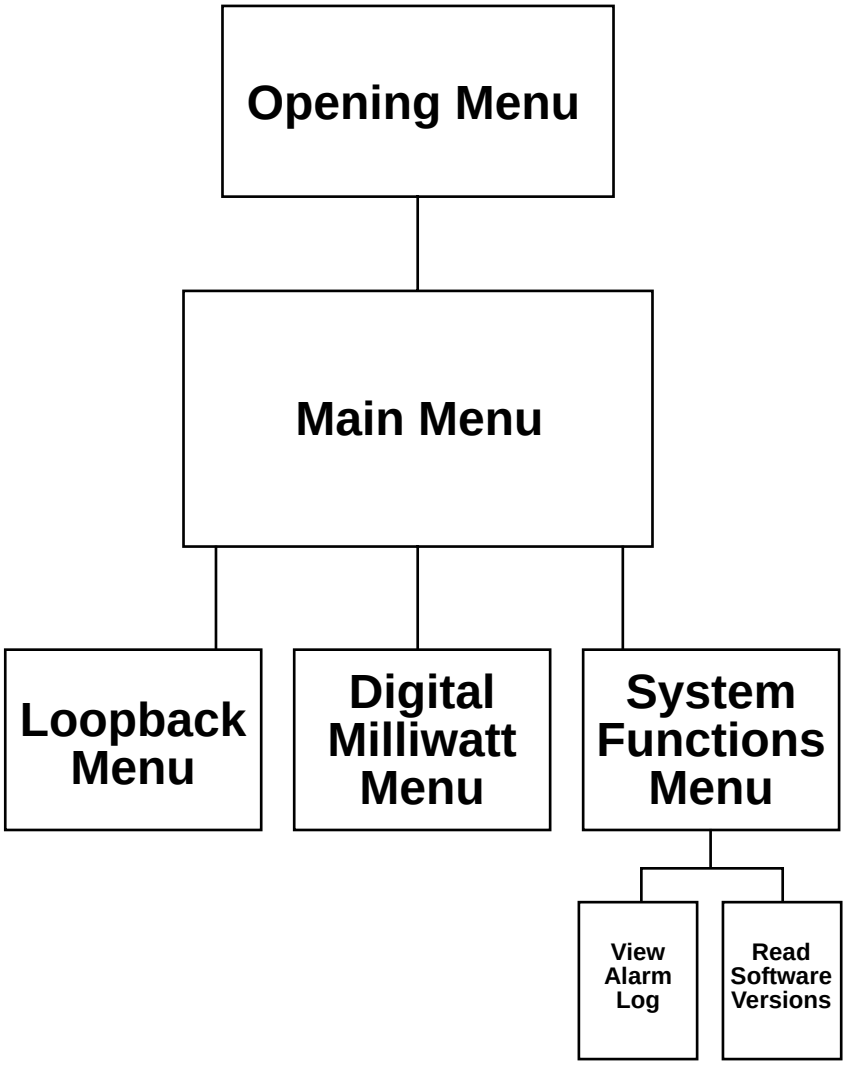


Fig. 9-4. Accessing Level 2 Security.

9.4 Level 1 Security

Refer to **Fig. 9-5** for the way to access level 1 security.

Level 1 provides access for viewing alarms and determining software versions.

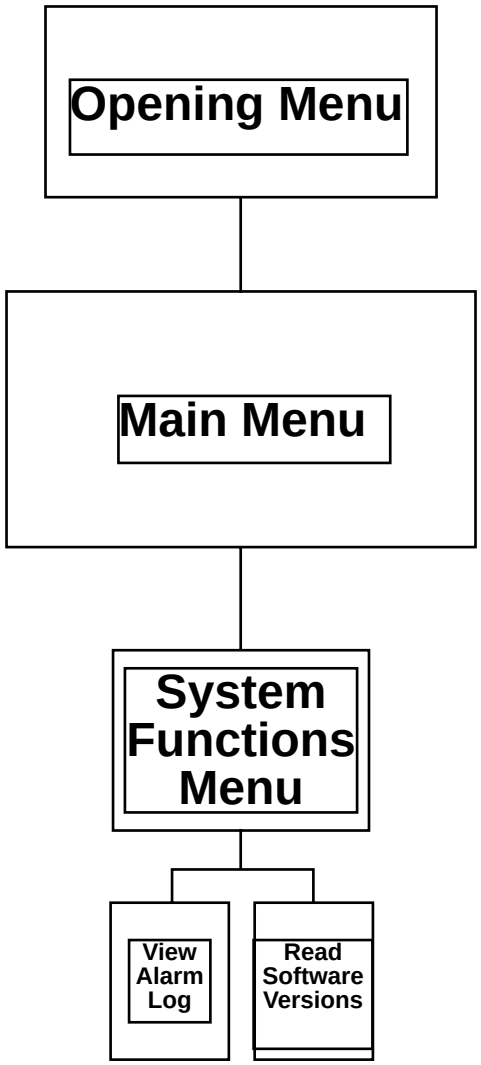


Fig. 9-5. Accessing Level 1 Security.

10. Configuring and Monitoring Plug-ins

Use these menus to configure and monitor both East and West T1 cards.

10.1 Configuring the T1 Network

The series of Configure Plug-ins menus consists of three assignment menus and access to eight types of plug-in cards.

1. Enter the Configure Plug-ins menus from the main menu by typing **5** and pressing Enter. See **Fig. 10-1**.
2. When you are asked which configuration, type **A**. Configure all cards under configuration A. Exit configuration A.
3. Exit the configuration by answering **yes** to write the configuration into memory.
4. Enter the clone feature. Copy A to B, X, or Y as required.

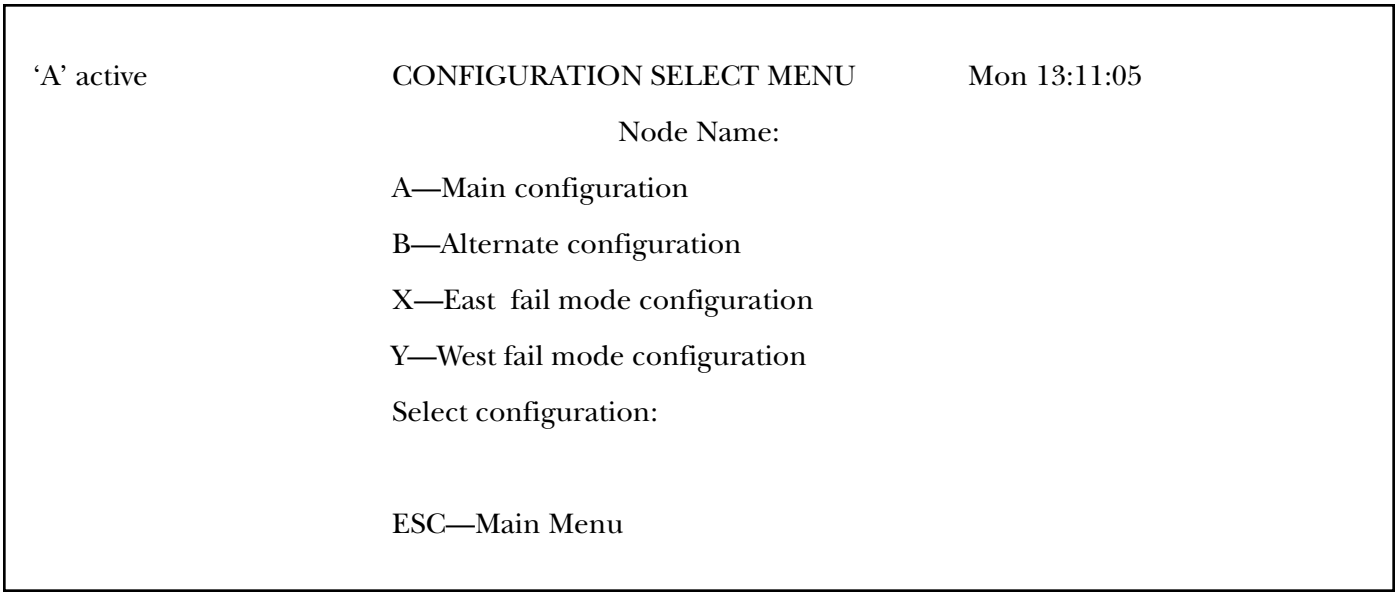


Fig. 10-1. Configuration Select Menu.

10.2 Configuring Shelf Plug-In Assignment Menu

The assignment menus display the channel cards by either shelf and slot position (Shelf Plug-in Assignment menu) or time slot position (Time Slot Assignment menu). There are two time slot assignment menus: one for the East T1 card and one for the West. See **Figures 10-2** and **10-3** for the shelf plug-in or time-slot assignments for the configurations.

These menus allow you to select a plug-in card to obtain or change configuration data for the T1 card set, the voice card set, the data card sets, and the modem card set. See **Fig. 10-4** for more information on how to configure the T1 logic card. You must configure the T1 logic card before you configure the other circuits. Do the basic A configuration before you do the B, X, or Y configurations. With configuration A, all options are available. Not all configuration options are available in X and Y. Use the B menu for an alternate configuration.

The Shelf Plug-in Assignments menu will list by chassis slot position for both shelf 1 (main shelf) and shelf 2 (expansion shelf) the cards inserted in a chassis. See **Fig. 10-2**. This screen displays:

- The type of front plug-in card
- The type of rear plug-in card
- Status—see **Table 10-1** for status indications
- T1 line (East or West) to which a T1 logic card is assigned, and whether it is configured as a primary or secondary card
- Time slot on East or West T1 to which a channel is assigned

'A' active CONFIGURE SHELF PLUG-IN ASSIGNMENTS Tue 13:39:33

'A' configuration

	Shelf 1			Node Name:		Shelf 2			
Slot	FPA	RPA	Status	Timeslot	Slot	FPA	RPA	Status	Timeslot
1	MCC	MCCNET	Ok		1				
2					2				
3					3				
4					4				
5					5				
6					6				
7	SDDC	OCU	Ok	E 1 E 2	7				
8	T1	CSU	Ok	E Primary	8				
9	DDC	V35-A	Ok	E 3 E 4	9				
10	PCM	FX0	Ok	E 5 6 7 8	10				
11	HSD	V35-A	Ok	E 9-22	11				
12					12				
13	DMC	RJ232	Ok	E 23 E 24	13				
14					14				

Enter Shelf and Slot (1/12, etc.):

ESC—Main menu RETURN—View Timeslot Display

Fig. 10-2. Configure Shelf Plug-in Assignments Menu.

Table 10-1. Summary of Card Status Indications.

Status Messages	Status
OK	No alarms
Alarm	T1 TPA alarm (CGA)
Alarm	T1 Red alarm
Alarm	T1 Yellow alarm, rear card missing
R. Plug	Rear card missing
Reset	Card was reset
Test	Card is in loopback
CBmode	Card is jumpered to operate in channel bank mode
EEPROM	Card's EEPROM has failed
SigCON	Signaling conflict exists on this card

Timeslot Assignment (East and West)

This screen displays the plug-in cards by time slot. See **Fig. 10-3**. You access this screen from the Shelf Plug-in Assignment menu by using the Enter key. The Enter key permits you to scroll through the selections of the configure shelf plug-in assignment menu and the Configure Timeslot Assignment menus for East and West. Use the other keyboard conventions as shown at the bottom of the screen to further configure each card. From the screen in **Fig. 10-3,** you can enter a time slot to select the individual plug-in card. This menu displays circuit names by time slot.

'A' active CONFIGURE EAST T1 TIMESLOT ASSIGNMENTS Mon 13:16:52

Node Name:

TS	Name	FPA	RPA	Stat	Loc	TS	Name	FPA	RPA	Stat	Loc
1		DDC	V35-A	Ok	1/02	13		— Idle —			
2		SDDC	OCU	Ok	1/03	14		— Idle —			
3		HSD	V35-A	Ok	1/04	15		— Idle —			
4		HSD	V35-A	Ok	1/04	16		— Idle —			
5		HSD	V35-A	Ok	1/04	17		— Idle —			
6		HSD	V35-A	Ok	1/04	18		— Idle —			
7		HSD	V35-A	Ok	1/04	19		— Idle —			
8		— Idle —				20		— Idle —			
9		DMC	RS232	Ok	1/11	21		PCM	4W AD	Ok	1/12
10		— Idle —				22		PCM	4W AD	Ok	1/12
11		— Idle —				23		PCM	4W AD	Ok	1/12
12		— Idle —				24		PCM	4W AD	Ok	1/12

Enter Timeslot:

ESC—Main Menu

Fig. 10-3. Time-slot Assignment Menu.

10.3 T1 Configuration Menu

Use the menu shown in **Fig. 10-4** to set up configuration parameters for the T1 card. You can access this menu through the following steps:

1. From the main menu, type 5 and press the Enter key.
2. Choose configuration A from the list by entering the letter A, and press the Enter key. Press Esc to return to the main menu.
3. When the screen for the Configure Shelf Plug-in Assignment menu appears, enter the shelf and slot position you need, such as **1/8**. Press the Enter key.
4. When the T1 configuration menu appears, you can use the Enter key to scroll through the configuration options. If you want to change an option, press the space bar to toggle another choice.

The TEST and ALARM notices could be on or off. The operator can switch to the monitor/test menu from this menu by entering **T**.

```
'A' active                    'A' CONFIGURATION MENU              Mon 13:12:15
Shelf 1  Slot 7               T1     DSX1          Ok     Node Name:
_____________________________________________________

      Card State (Offline, Online)                    —> Online
      Direction                                          East
      Primary/Secondary                                  Primary
      Node Type (End, D&I)                               End
      Line Code (AMI, B7ZS, B8ZS)                        B8ZS
      Framing (ESF, D4)                                  ESF
      Timing (Internal, Loop)                            Internal
      Transmit Line Buildout                             0-133 ft
      Received Line Buildout                             N/A

      SPACE—Change Choice      <Arrow Keys>—Select Field
      T—Monitor/Test Menu      ESC—Previous Menu
```

Fig. 10-4. T1 Configuration menu with CSU.

The fields of this screen are:

Card State (Off-Line, On-Line)

This selection permits an operator to remove a T1 card off-line or activate a card on-line.

Direction (East, West)

This allows the selected plug-in T1 logic card to be designated an East T1 or a West T1. The East T1 will provide shelf timing.

Primary/Secondary (Pri/Sec)

When two T1 cards are configured for redundant logic, one is designated the primary; the other is secondary. This allows two cards to be assigned to one T1 line without the MCC reporting a conflict. It also establishes which T1 card will be on-line after powerup. This selection permits designating a primary and secondary T1 logic card for either direction (East, West) for redundant T1 card sets. The back-up, or secondary, T1 card can be brought on-line and the primary T1 card can be taken off-line in the event of a failure.

For example, configure the East T1 cards as follows:

- In the A configuration, Pri is on-line and Sec is off-line.
- In the X configuration, Pri is off-line and Sec is on-line.

This occurs because a failure on the East side will result in an automatic fallback from A to X. A failure on the West side creates a fallback from A or B to Y.

Node Type (End)

An end multiplexor is selected when only one T1 line is actively associated with the T1 Channel Bank.

- When END node is selected, all ones are put into DS0 (time slots) if no channel card is assigned to the channel slot or the card is removed.

Line Code (AMI, Bit 7 Stuff and B8ZS)

This selects the method the multiplexer uses to protect against transmitting more than 15 zeros:

- AMI—No rule is applied. No alternation of the multiplex bits is done when zeros are detected in the stream. This can be used in applications where the data terminal equipment connected to the multiplexor ensures that no more than 15 zeros are transmitted.
- Bit 7 stuff conforms to AT&T publications 43801 and inserts a 1 in Bit 7 of voice time slot that contains all zeros in bits 1-8.
- B8ZS conforms to AT&T publications 43801 and 62411 and transmits a specified bipolar violation code on the T1 line if 8 zeros are detected. This is used on T1 lines compatible with B8ZS. No restrictions are placed on the data transmitted in a time slot. This is referred to as clear channel service. (N x 56 or N x 64 data can be used.)

Framing (ESF, D4)

This selects either ESF or D4:

- ESF conforms to the Extended Superframe (AT&T publication 62411) ESF.
- D4 conforms to the D4 Superframe format standard.

Timing (Int, Loop)

This selects the timing mode for the T1 logic card. Although the West T1 logic card will always slave its timing to the East card, this selection is applicable for the West card because it determines the default mode of the West card when the East card has failed or lost timing reference. The selections are:

- Internal - This selects the system clock to be referenced to a local oscillator. Select this only when the multiplexor is to provide master timing.
- Loop - This selects the system clock to be referenced to the received signal and is used in loop timing applications. The system clock is derived from the receive T1 line signal.

All installations should have a timing plan. A timing plan establishes the timing selection for all modes in a network of multiplexors. See **Chapter 10** for more information about the network timing plan.

Line Buildout (CSU)

Refer to **Fig. 10-4**. For line compensation, select a line attenuation from the following: 0.0dB, 7.5dB, 15.0dB, and 22.5dB. Use the largest attenuation setting possible without causing a yellow alarm at the end being configured.

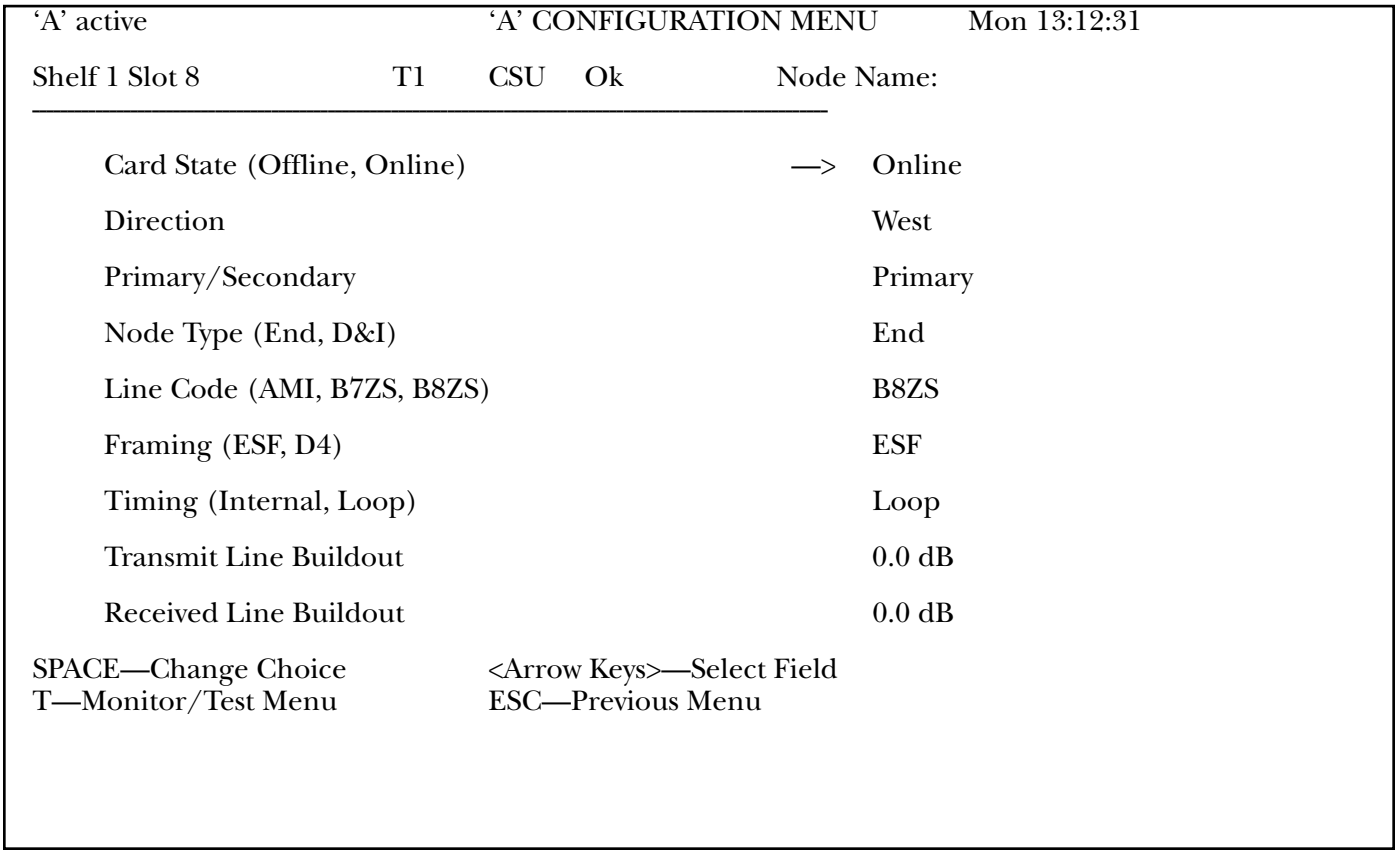


Fig. 10-5. T1 Configuration Menu With DSX.

Transmit Line Buildout (DSX)

Refer to **Fig. 10-5**. For line compensation, select a cable based upon line length from the following—0-133 feet, 133-266 feet, 266-399 feet, 399-533 feet, 533-655 feet.

Received Line Buildout

The received line buildout is detected by the T1 card when a CSU is installed. See **Fig. 10-4**. This field is not applicable when a DSX rear card is installed.

10.4 Quad PCM Voice Card Configuration Menu

Use the menu shown in **Fig. 10-6** to set up configuration parameters for the quad PCM card. You can access this menu through the following steps:

1. From the main menu, type in 5 - Configure Plug-ins, and press the Enter key.
2. Choose a configuration from the list by entering the letter **A**, **B**, **X,** or **Y** and press the Enter key. Press Esc to return to the main menu.
3. When the screen for the shelf plug-in assignment menu appears, enter the shelf and slot position you need, such as **1/10**. Press the Enter key.
4. When the PCM configuration menu appears, you can use the arrow keys to scroll through the configuration options. If you want to change an option, press either **+** or **-** to toggle another choice.

The operator can switch to the monitor/test menu from this menu by entering **T**.

'A' active		'A' CONFIGURATION MENU			Mon 13:12:57
Shelf 1	Slot 12	PCM 4W	AD	Ok	Node Name:
Setup Options		Channel 1	Channel 2	Channel 3	Channel 4
Circuit Name		....	....	....	....
Direction	—>	East	East	East	East
Time Slot (1-24)		21	22	23	24
Relative Transmit tlp		+0.0	+0.0	+0.0	+0.0
Relative Receive tlp		+0.0	+0.0	+0.0	+0.0

±—Change Choice <Arrow Keys>—Select Field
T—Monitor/Test Menu D—Default tlp Levels
ESC—Previous Menu

Fig. 10-6. Quad PCM Voice Card Configuration Menu.

It is valuable to have a common variable name be associated with interconnected channels that make up one contiguous service. For example, a T1 Channel Bank is used as an access multiplexer to a long distance carrier for private line (3002) analog modem circuits. At the carrier's point-of-presence (POP) the individual time slots (or DS0s) are interconnected to individual private line circuits. These circuits are assigned circuit numbers by the common carriers. These same numbers can be entered into the circuit name field on this screen for providing a reference.

The fields of this screen are:

- Circuit Name - An 8-character alphanumeric field for establishing a circuit name
- Direction - Selection of which T1 (East or West) the channels are assigned to
- Time slot - Selection of a time slot a channel is assigned to
- Relative transmit and receive gain parameters - relative to the stipulated offset for the particular interface

10.5 High Speed Data Channel Configuration Menu

Use the menu shown in **Fig. 10-7** to set up configuration parameters for the HSD card. You can access this menu through the following steps:

1. From the main menu, type in 5 - Configure Plug-ins, and press the Enter key.
2. Choose a configuration from the list by entering the letters A, B, X, or Y and press the Enter key. Press Esc to return to the main menu.
3. When the screen for the shelf plug-in assignment menu appears, enter the shelf and slot position you need, such as 1/11. Press the return key.
4. When the HSD configuration menu appears, you can use the arrow keys to scroll through the configuration options. If you want to change an option, press either the + or - to toggle another choice. You can switch to the monitor/test menu from this menu by entering T.

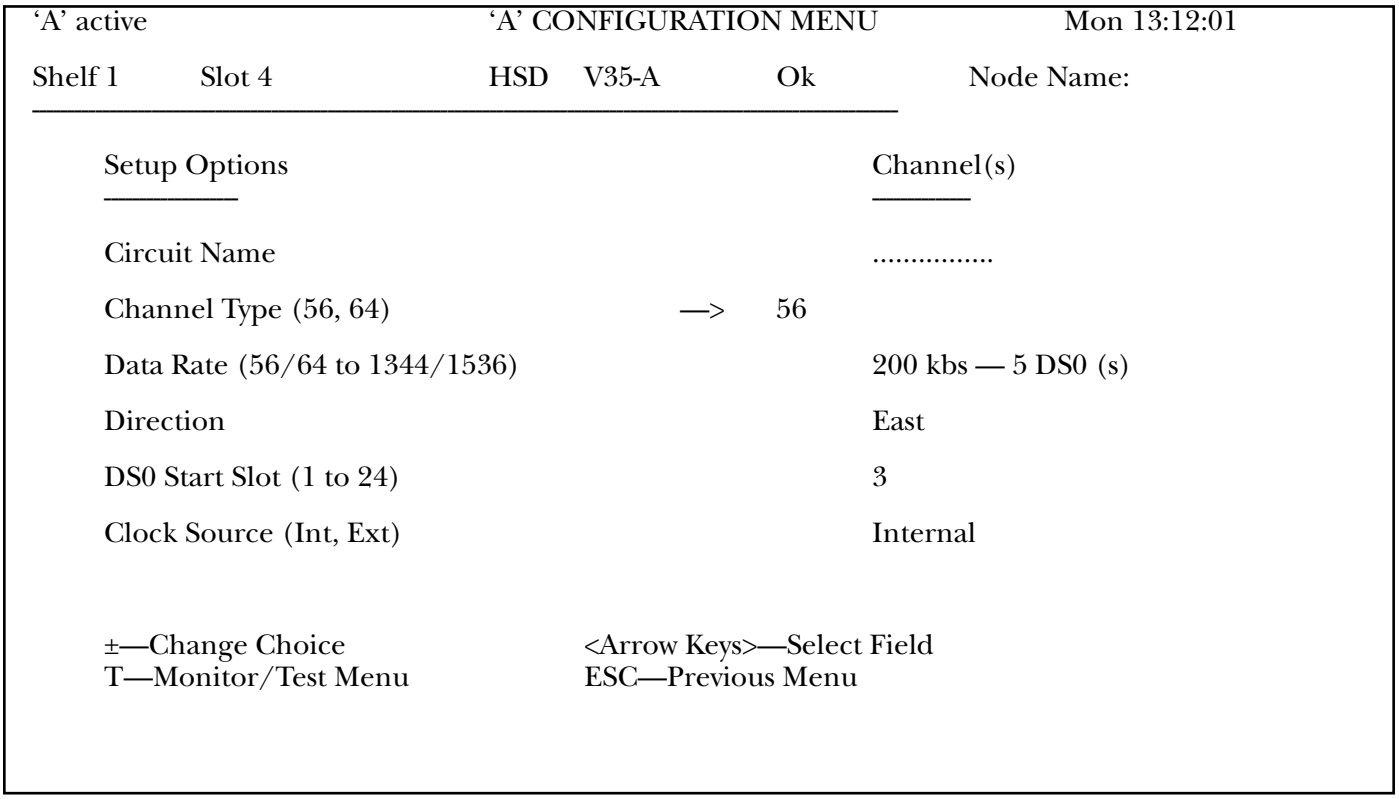


Fig. 10-7. High Speed Data Channel Configuration Menu.

The fields of this screen are:

- Circuit Name - An 8 character alphanumeric field for establishing a variable name.
- Channel type (56, 64) - This field is used to select the root rate of the data.
- Data rate (56/64 to 1344/1536) - Using the - or + key, the operator can step through and assign multiple time slots to a data card. The data rate is the number of time slots assigned times the root rate (channel type 56/64 selected). The highest rate depends on the number of time slots from the DS0 Start Slot to Slot 24. Conflicts with other channels are displayed in the status field on screens "shelf plug-in assignment" and "time slot assignment."
- Direction - Selection of which T1 (East or West) the channel or channels are assigned to.
- DS0 Start Slot (1 to 24) - This field selects the start DS0 time slot the high speed data channel is assigned to. The maximum number of DS0 time slots a data channel card can be assigned to is the start DS0 plus all of the DS0s after this to DS0 24. For example: if the channel type selected is 56, and the DS0 start slot is 23, then the data rates that can be selected (in the data rate field) are 56 and 128 Kbps. Channels must be contiguous, and they will not roll over past channel 24.
- Clock source (Int, Ext) - This field selects between an internal or external clock associated with the data channel's transmit data. If an external clock is used, it must be synchronous with the T1 Channel Bank's system clock. The appropriate selection recommended by the standards organizations for data rates over 56/64 Kbps is to use external timing on the high speed data card, with timing looped by the DTE. This approach maintains the phase relationship between transmit data and the clock used to sample the transmit data.

10.6 Subrate DDC Configuration Menu

Use the menu shown in **Fig. 10-8** to set up configuration parameters for the SDDC card. Access this menu with the following steps:

1. From the main menu, type **5** and press the Enter key.
2. Choose a configuration from the list by entering the letter **A**, **B**, **X**, or **Y** and press the Enter key. Press Esc to return to the main menu.
3. When the screen for the configure shelf plug-in assignment menu appears, enter the shelf and slot position you need, such as **1/7**. Press the Enter key.
4. When the SDDC configuration menu appears, you can use the arrow keys to scroll through the configuration options. If you want to change an option, press either **+** or **-** to toggle another choice. You can switch to the monitor/test menu from this menu by entering **T**.

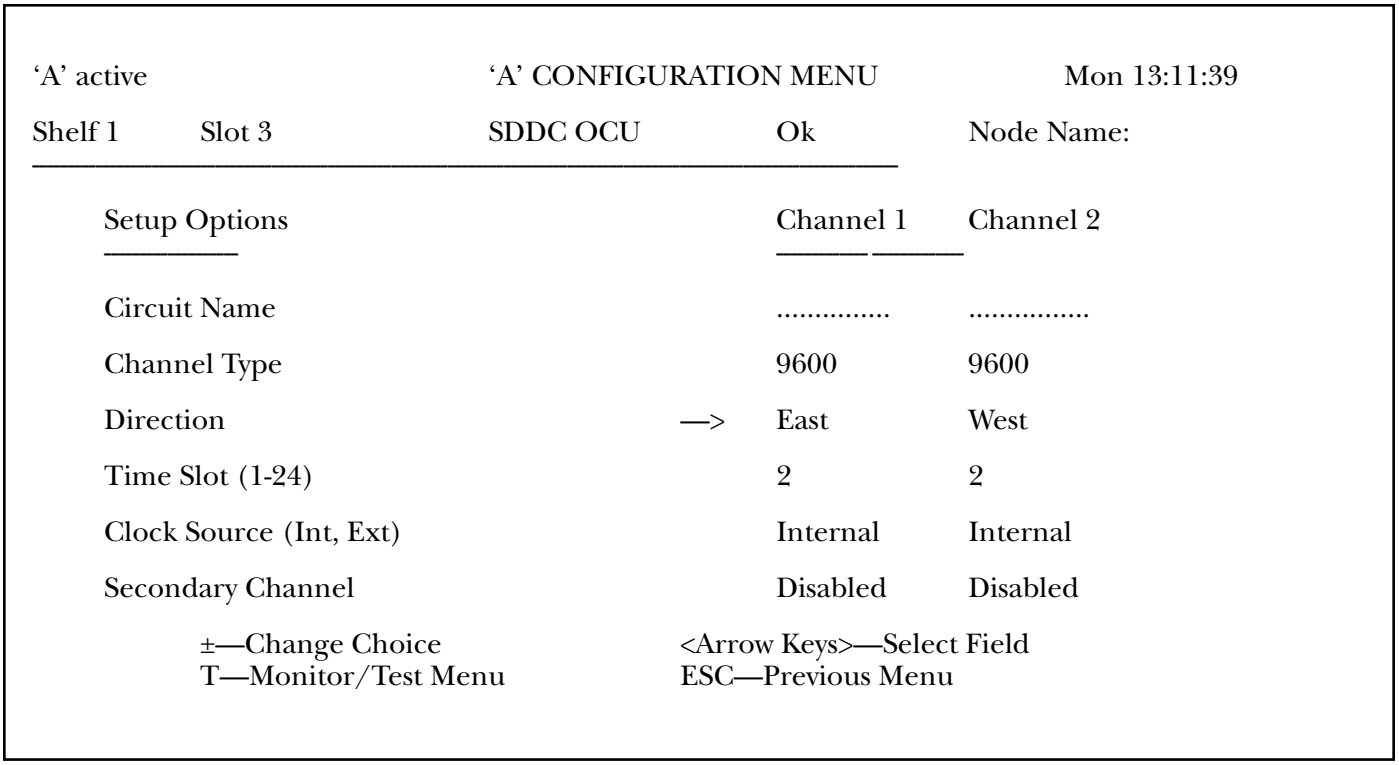


Fig. 10-8. Subrate DDC Configure Menu.

The fields of this screen are:

- Circuit Name - An 8-character alphanumeric field for establishing a circuit name.
- Channel Type - The subrate DDC card operates at 9600 baud only.
- Direction - Selection of which T1 (East or West) the channel is assigned to.
- Time slot - Selection of time slot a channel is assigned to.
- Clock Source - The subrate DDC card can operate on an internal or external clock.
- Secondary Channel - The secondary channel can be enabled or disabled.

10.7 DDC Configuration Menu

Use the menu shown in **Fig. 10-9** to set up configuration parameters for the DDC cards. You can access this menu through the following steps:

1. From the main menu, type **5** and press the return key.
2. Choose a configuration from the list by entering the letter **A**, **B**, **X**, or **Y** and press the return key. Press Esc to return to the main menu.
3. When the screen for the configure shelf plug-in assignment menu appears, enter the shelf and slot position you need, such as **1/7**. Press the Enter key.
4. When the DDC configuration menu appears, you can use the arrow keys to scroll through the configuration options. If you want to change an option, press either **+** or **-** to toggle another choice. You can switch to the monitor/test menu from this menu by entering **T**.

```
'A' active              'A' CONFIGURATION MENU              Thu 09:16:50
Shelf 1    Slot 5       DDC   V35-A      Ok          Node Name: .....
```

Setup Options		Channel 1	Channel 2
Circuit Name		.....	.....
Channel Type (56,64,SW56,SW56—E&M)	—>	56	56
Direction		East	East
Time Slot (1-24)		4	6
Clock Source (Int, Ext)		Internal	Internal

```
        ±—Change Choice          <Arrow Keys>—Select Field
        T—Monitor/Test Menu      ESC—Previous Menu
```

Fig. 10-9. DDC Configuration Menu.

The fields of this screen are:

- Circuit Name - An 8-character alphanumeric field for establishing a circuit name.
- Channel Type - The DDC card can operate at 56K, 64K, Sw56K, or Sw56 E&M.
- Direction - Selection of which T1 (East or West) the channel is assigned to.
- Time slot - Selection of time slot a channel is assigned to.
- Clock Source - The DDC card can operate on an internal or external clock.

10.8 Dual Modem Configuration Menu

Use the menu shown in **Fig. 10-10** to set up configuration parameters for the DMC card. Follow these steps:

1. From the main menu, type **5** and press the Enter key.
2. Choose a configuration from the list by entering the letter **A**, **B, X**, or **Y** and press the Enter key. Press Esc to return to the main menu.
3. When the screen for the configure shelf plug-in assignment menu appears, enter the shelf and slot position you need, such as **1/13**. Press the Enter key.
4. When the DMC configuration menu appears, you can use the arrow keys to scroll through the configuration options. If you want to change an option, press either **+** or **-** to toggle another choice. You can switch to the Monitor/Test menu from this menu by entering **T**.

```
'A' active                    'A' CONFIGURATION MENU          Thu 09:16:50
Shelf 1      Slot 5           DDC   V35—A      Ok            Node Name: .....
```

Setup Options		Channel 1	Channel 2
Circuit Name		.....	.....
Direction	—>	East	West
Time Slot (1-24)		9	9
A/B Signaling		Enabled	Enabled
Signaling		FXS—LS	FXS—LS
Glare Resolution		Disabled	Disabled

```
±—Change Choice              <Arrow Keys>—Select Field
M—Modem Control Menu         C—Clone Config Menu
P—Phone/Dial Menu            S—S-Register Menu
T—Monitor/Test Menu          ESC—Previous Menu
```

Fig. 10-10. Dual Modem Configuration Menu.

The fields of this screen are:

- Circuit Name - An 8-character alphanumeric field for establishing a circuit name.
- Direction - Selection of which T1 (East or West) the channel is assigned to.
- Time slot - Selection of time slot a channel is assigned to.
- A/B Signaling - Enable or disable A/B signaling bits.
- Signaling Type - Select signaling type. (See explanation of the signaling types below.)
- Glare Resolution - Enable or disable glare resolution.

Signaling Types

1. FXS-LS—FXS loop start
2. FXS-GS—FXS ground start
3. FXS-LC—FXS loop start conversion
4. FXS-GC—FXS ground start conversion
5. FXS-ARDLS—FXS auto-ringdown loop start
6. FXS-ARDGS—FXS auto-ringdown ground start
7. Immediate—Immediate start. A method of engaging a trunk or access line in which no start-dial signal is used. The initiating CPE or office simply seizes the trunk or access line and begins sending address bits. This generally is for MEGACOM options. Because immediate start is not amenable to glare detection, it is never recommended that two-way trunks be provisioned for immediate start in both the inward and outward directions. Immediate start can be used in the inward direction on a two-way trunk with inward dialing suppressed, but the CPE should be the glare-resolving party. This is common to 56-Kbps trunks; it is unusual on voiceband and voiceband data trunks.

8. Wink—Wink start. A method of engaging a trunk or access line to set up a call, performing an integrity check on it, and establishing a proper time to transmit address information. At first glance, wink start may be viewed as a special case of DDSD, where the delay-dial signal is of a short, specified duration. It is a handshaking and timed acknowledgment. After toggling a bit, the central office gives DTMF (dual-tone multifrequency) tones. If a glare lasts too long, the CPE&A considers the off-hook signal to be a wink. Wink start is the preferred method of call control because it inherently offers an integrity check on the trunk and because it provides for rapid detection and resolution of glare on two-way trunks.

9. DDSD—Delay-dial start-dial signaling. A method of engaging a trunk or access line to set up a call, performing an integrity check on it, and establishing a proper time to transmit address information. For example, suppose a call comes into a PBX over a DDSD access line. The ACP alerts the PBX of the call by transmitting off-hook, i.e., by seizing the access line. The PBX transmits off-hook toward the ACP until it is ready to receive DID address information. This is the delay-dial signal. When ready to receive address digits, the PBX transmits on-hook. The off-hook to on-hook transition constitutes the start-dial signal and is analogous to dial tone. The ACP, satisfied that the channel and PBX are operational (since it has received the delayed-dial and start-dial signals), transmits the address information. It is possible to mix signaling types on a given trunk (e.g., DDSD inward with wink start outward), but some signaling combinations are not allowed. DDSD is sometimes referred to as delay-dial with integrity check. DDSD control procedures are similar to those for wink start, except that different timing recommendations apply.

10.9 MCC Configuration Menu

Use the menu shown in **Fig. 10-11** to display switch settings for the MCC card.

1. From the main menu, type **5** and press the Enter key.

2. Choose a configuration from the list by entering the letter **A**, **B**, **X,** or **Y** and press the Enter key. Press Esc to return to the main menu.

3. When the screen for the shelf plug-in assignment menu appears, enter the shelf and slot position you need, such as **1/1**. Press the Enter key.

4. When the MCC configuration menu appears, you can view the DIP switch configuration. However, there are no user options available. To change any switch setting, you must remove the MCC card and change the switch manually.

'A' active 'A' CONFIGURATION MENU Thur 16:36:27

Shelf 1 Slot 1 MCC MCCNET Ok Mode Name: Penril

Switch S1

	1	2	3	4	5	6	7	8
On					X	X		
Off	X	X	X	X			X	X

Switch S2

	1	2	3	4	5	6	7	8
On			X					
Off	X	X		X	X	X	X	X

4	5	6	MCC Baud Rate
On	On	Off	1200 Baud
Off	Off	On	2400 Baud
On	Off	On	4000 Baud
Off	On	On	9600 Baud
On	On	On	19200 Baud

Switches 1,2,3,7,8 Not Used

On	Off
1 Expansion Shelf	Standard Shelf
2 MCC Dominant	Chan Cards Dominant
3 Penril Test	Normal
4 Configured CB	Normal Mode
5 VT-52 Terminal	VT-100 Terminal

6-8 Not Used

ESC - Previous Menu

Fig. 10-11. MCC Switch Configuration Menu.

10.10 Four Basic Configurations

Four basic configurations are available for A, B, X, and Y. These configurations toggle with each other, and you rotate to each of them by using the Enter key. Selecting "Config" allows you to edit your choice of configuration.

A and B Configurations

A and B configurations are triggered by the TOD (time of Day) clock. A could be used for day time operation while B is used for nighttime operation. If you are using only one configuration, clone that configuration to all the others.

X and Y Configurations

X and Y configurations are configurations that come on line if there is an alarm on the T1 trunk. X is for the East-side trunk and Y is for the West side trunk.

Possible Configurations

- In a standard one-trunk D4 channel bank (East trunk), configure only A and clone it. You can modify as required.
- If you have two trunks in the D4 channel bank (East and West trunks), configure A, X, and Y.
- If you have two trunks and you need a day and night configuration as well, then program A, B, X, and Y.

Configuring A and X

For example, if you have one T1 trunk (East side) and no night time configuration, program the T1 in these steps—

1. Enter the configure shelf assignment menus from the main menu by selecting option 5, "Configure Plug-ins," and pressing Enter. When you are asked which configuration, type in **A**. Proceed with all cards, choosing normal configurations. Exit configuration A.
2. Enter the clone feature. Copy the A configuration to X.
3. Modify X as required.
4. Exit the configuration by answering **yes** to write the configuration into memory.

NOTE

In summary, all configurations are done the same as explained in the steps above. A and B configurations are selected by time. X and Y configurations are failure configurations. You can switch one time only in a failure mode.

10.11 Monitoring the T1 Network

To monitor channel cards and observe all the parameters of the channels, use the monitor shelf plug-in assignment menu. This also allows you to loopback. From the main menu, select 4, "Monitor/Test Plug-ins" to view the monitor-shelf plug-in assignments. See **Fig. 10-12**. Press Enter to view the monitor East time slot assignments. See **Fig. 10-13**. By pressing Enter again, you will see the monitor West time slot display. Press Enter again to return to the Monitor Shelf Plug-in Assignments menu. See **Fig. 10-12**.

'A' active MONITOR SHELF PLUG-IN ASSIGNMENTS Mon 13:14:10

Shelf 1 Node Name: Shelf 2

Slot	FPA	RPA	Status	Timeslot	Slot	FPA	RPA	Status	Timeslot
1					1				
2	DDC	V35-A	Ok	E 1 W 1	2				
3	SDDC	OCU	Ok	E2 W 2 3					
4	HSD	V35-A	Ok	E 3-7	4				
5					5				
6					6				
7	T1	DSX1	Ok	E Primary	7				
8	T1	CSU	Ok	W Primary	8				
9					9				
10					10				
11	DMC	RS232	Ok	E 9 W 9	11				
12	PCM	4W AD	Ok	E 21 22 23 24	12				
13	HSD	RS232	Ok	W 3	13				
14	PCM	4W E&M	Ok	W 4 5 6 7	14				

Enter Shelf and Slot (1/12, etc.):

ESC—Main menu RETURN—View Timeslot Display

Fig. 10-12. Monitor Shelf Plug-in Menu.

'A' active MONITOR EAST T1 TIMESLOT ASSIGNMENTS Mon 13:14:23

Node Name:

TS	Name	FPA	RPA	Stat	Loc	TS	Name	FPA	RPA	Stat	Loc
1	.....	DDC	V35-A	Ok	1/02	13		— Idle —			
2	.....	SDDC	OCU	Ok	1/03	14		— Idle —			
3	.....	HSD	V35-A	Ok	1/04	15		— Idle —			
4	.....	HSD	V35-A	Ok	1/04	16		— Idle —			
5	.....	HSD	V35-A	Ok	1/04	17		— Idle —			
6	.....	HSD	V35-A	Ok	1/04	18		— Idle —			
7	.....	HSD	V35-A	Ok	1/04	19		— Idle —			
8		— Idle —				20		— Idle —			
9	.....	DMC	RS232	Ok	1/11	21	.....	PCM	4W AD	Ok	1/12
10		— Idle —				22	.....	PCM	4W AD	Ok	1/12
11		— Idle —				23	.....	PCM	4W AD	Ok	1/12
12		— Idle —				24	.....	PCM	4W AD	Ok	1/12

Enter Timeslot:

ESC—Main Menu

Fig. 10-13. Monitor Timeslot Assignment Menu.

10.12 T1 Card Monitor/Test Menu

Use the menu shown in **Fig. 10-14** to monitor and test the T1 card. You can access this menu with the following steps:

1. From the main menu, type **4** and press the Enter key.
2. When the screen for the Monitor Shelf Plug-in Assignment menu appears, enter the shelf and slot position you need, such as **1/8**. Press the Enter key.
3. When the T1 Monitor/Test menu appears, you can use the arrow keys to scroll through the test options. If you want to change an option, press the space key for another choice.

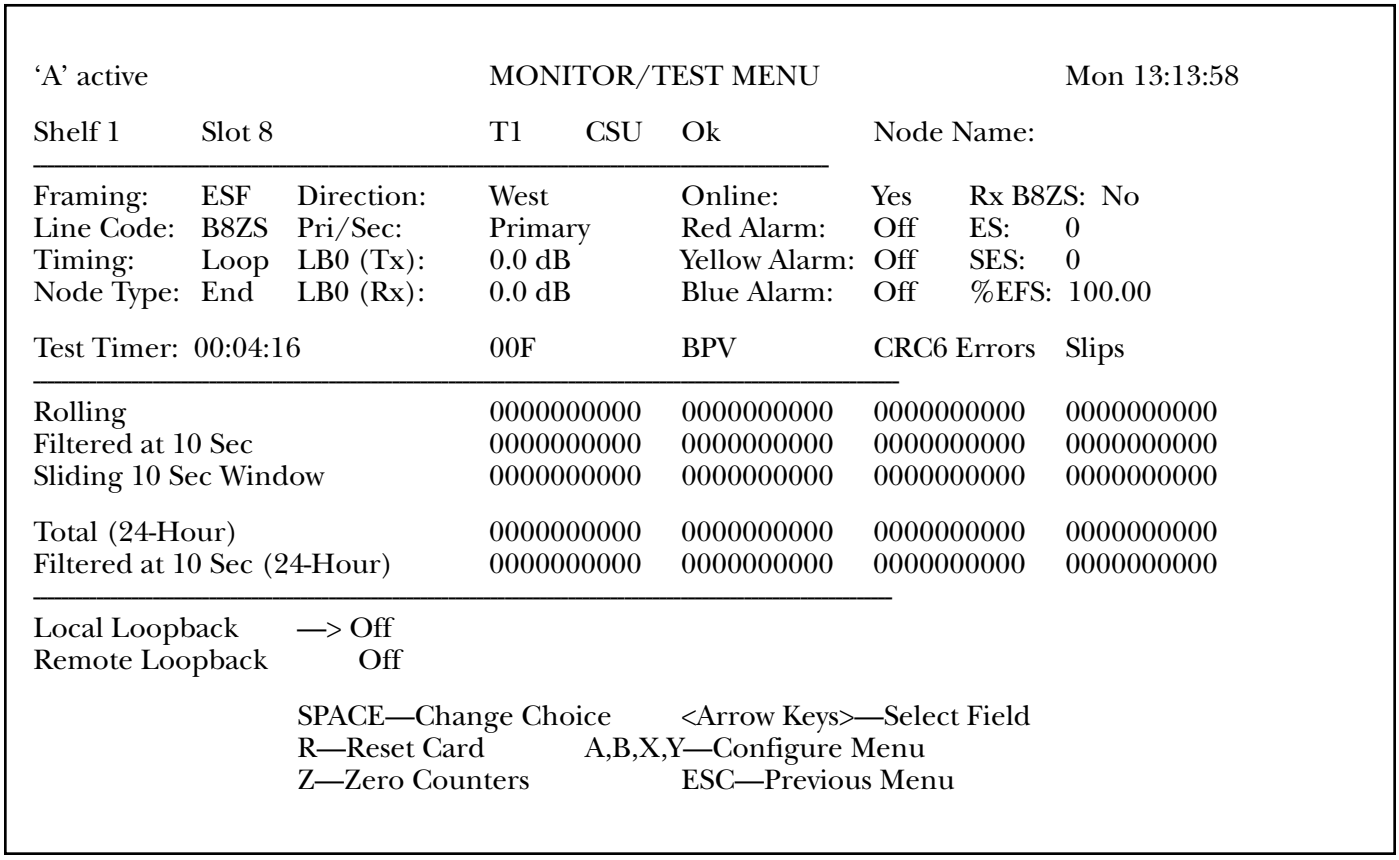


Fig. 10-14. Monitor/Test Plug-ins Menu.

The screen in **Fig. 10-14** displays the status and configuration information for the T1. The following parameters are provided:

- Framing - ESF, D4
- Line code - B8ZS, Bit 7 stuff, AMI
- Timing - Internal/Loop
- Node Type - End/D&I
- Direction - East/West
- Pri/Sec - Primary/Secondary
- LBO (Tx) - Transmit line buildout (feet or dB)
- LBO (Rx) - Receive line buildout (CSU only)
- Online - Yes/No (NOTE: continuously monitored)
- Red alarm - This alarm means that the T1 card is detecting a loss of T1 signal or out-of-frame condition. This also indicates the status of the Red LED on this T1 card.
- Yellow alarm - This indicates that the T1 card is detecting a yellow alarm pattern being generated from the far end or network. This shows the status of the Yellow LED on this T1 card.
- Blue alarm - This means that the T1 card is detecting a test-on condition from the far end.
- Rx B8ZS - Yes/No indicates B8ZS code words received.
- ES - Count of errored seconds. This parameter resets at midnight.
- SES - Count of severely errored seconds. This parameter resets at midnight.
- % EFS - Percent of error-free seconds since midnight.

- OOF - This field displays the number of out of frames received on a T1 line.
- BPV counter - This field displays the number of bipolar violations received on a T1 line.
- Ft errors/CRC6 - This field displays the number of Ft bit errors when you select D4 framing. It displays the number of CRC6 errors when you select ESF framing.
- Slips - This field displays the number of clock slips received on a T1 line.
- Test timer - The test timer (00:00:00) indicates the time span since the counter was last zeroed. After 12 midnight, the timer resets to zero. The top numbers of the rolling area are then placed in the 24-Hour section of the screen.

The screen in **Fig. 10-15** allows for the following operator actions:

- Local loopback - This field allows you to put a T1 Channel Bank in and out of local loopback by using the space key. Disruptive.
- Remote loopback - Use this to loop the T1 back to the network for a connecting line check. This is disruptive.
- Reset - Selecting R will reset the card. This is disruptive.
- Zero - Selecting Z resets all counters to zero.
- Configure - Selecting A, B, X, or Y switches to the A, B, X, or Y configure menu for this card.

Table 10-2. T1 Card LED Indications.

LED	Description	ON	OFF	Blinking
LAL	Local loopback	NA	Not in loopback	Rear card in loopback
ONL	On-line	T1 logic card is on-line	T1 logic card is off-line	NA
ALM	Alarm	Red or yellow T1 alarm (see below)	When on-line, good T1 signal	NA
RED	Red alarm	Loss of T1 line signal or frame sync	When on-line, REC good T1 line signal	When on-line REC unframed all ones (Blue alarm)
YEL	Yellow alarm	REC yellow T1 alarm signal (far end in red)	When on-line not REC yellow alarm	When on-line REC a framed all ones
RBV	Receive bipolar violation	A bipolar violation has been detected	No bipolar violation has been detected	LED will blink at rate of deteced BPVs

10.13 T1 Card LEDs

When the MCC configures which T1 card is on-line, and then a front panel switch change is made to switch the one card, the system will default back to the MCC configured state after power is resumed.

The alarm LED will stay on for 12-14 seconds after red alarm clears. This is to ensure that the T1 signal is stable before the T1 Channel Bank releases the channel cards back into service.

BPV Errors

Intentional BPVs—When in B8ZS, the BPVs are not counted.

10.14 Quad PCM Voice Card Monitor/Test Menu

Use the menu shown in **Fig. 10-15** to monitor and test the quad PCM cards. You can access this menu with the following steps:

1. From the main menu, type **4** and press the Enter key.
2. When the screen for the Monitor Shelf Plug-in Assignments menu appears, enter the shelf and slot position you need, such as **1/10**. Press the Enter key.

```
'A' active                    MONITOR/TEST MENU          Mon 13:13:13
Shelf 1      Slot 12          PCM   4W AD      Ok         Node Name:
_____________________________________________________________________

Setup Options          Channel 1    Channel 2    Channel 3    Channel 4
_____________          _________    _________    _________    _________
Circuit Name           ..........   ..........   ..........   ..........
Direction              East         East         East         East
Time Slot              21           22           23           24
Relative Transmit tlp  +0.0         +0.0         +0.0         +0.0
Relative Receive tlp   +0.0         +0.0         +0.0         +0.0

Test Options
____________
Local Loopback     —>  Off          Off          Off          Off


                  SPACE—Change Choice          <Arrow Keys>—Select Field
                  R—Reset Card              A,B,X,Y—Configure Menu
                                            ESC—Previous Menu
```

Fig. 10-15. Quad PCM Voice Card Monitor Menu.

3. When the QPCM monitor/test menu appears, you can use the arrow keys to scroll through the test options. If you want to change an option, press the space key for another choice.

The fields of this screen are:

- Circuit Name - An 8-character alphanumeric circuit name.
- Direction - Selected T1 line (East or West).
- Time slot - Selected time slot of the channel.
- Relative Transmit tlp - Selected transmit test level point.
- Relative Receive tlp - Selected receive test level point.

The screen in **Fig. 10-15** allows for these operator entries:

- Local Loopback - This field allows you to put the selected channel in and out of loopback by using the space key.
- Reset - Selecting R will reset the card. This is disruptive.
- Configure - Selecting A, B, X, or Y switches to the A, B, X, or Y configure menu for this card.

10.15 High Speed Data Channel Monitor/Test Menu

Use the menu shown in **Fig. 10-16** to monitor and test the HSD cards. You can access this menu with the following steps:

1. From the main menu, type **4** and press the Enter key.
2. When the screen for the Monitor Shelf Plug-in Assignment menu appears, enter the shelf and slot position you need, such as **1/11**. Press the Enter key.
3. When the HSD monitor/test menu appears, you can use the space key to toggle the loopback state.

```
'A' active                    MONITOR/TEST MENU          Mon 13:15:14
Shelf 1      Slot 4           HSD   V35—A      Ok       Node Name:
_____________________________________________________________________

                  Setup Options                  Channel(s)
                  _____________                  __________
                  Circuit Name                   .................
                  Channel Type                   56
                  Data Rate                      200 kbs—5 DS0(s)
                  Direction                      East
                  DS0 Start Slot                 3
                  Clock Source                   Internal

                  Test Options
                  ____________
                  Local Loopback          —>     Off


          SPACE—Change Choice              A,B,X,Y—Configure Menu
          R—Reset Card                  ESC—Previous Menu
```

Fig. 10-16. 56/64 High-Speed Data Channel Monitor and Test Menu.

The screen in **Fig. 10-16** displays the monitor and test information for the HSD. The following parameters are provided:

- Circuit Name - An 8-character alphanumeric circuit name.
- Channel Type - 56/64 Kbps.
- Data Rate - 56K - 1344 Kbps.
- Direction - Selected T1 line (East or West).
- DSO Start Slot - Selected start timeslot.
- Clock Source - Selected external clock.

The screen in **Fig. 10-16** allows for these operator entries:

- Local Loopback - This field allows you to put the selected channel in and out of loopback using the space key.
- Reset - Selecting R will reset the card. This is disruptive.
- Configure - Selecting A, B, X, or Y switches to the A, B, X, or Y configure menu for this card.

10.16 Subrate DDC Monitor/Test Menu

Use the menu shown in **Fig. 10-17** to monitor and test the DDC card. You can access this menu through the following steps:

1. From the main menu, type **4** and press the Enter key.
2. When the screen for the Shelf Plug-in Assignment menu appears, enter the shelf and slot position you need, such as **1/7**. Press the Enter key.
3. When the SDCC Monitor/Test menu appears, you can use the arrow keys to scroll through the test options. If you want to change an option, press the space key for another choice.

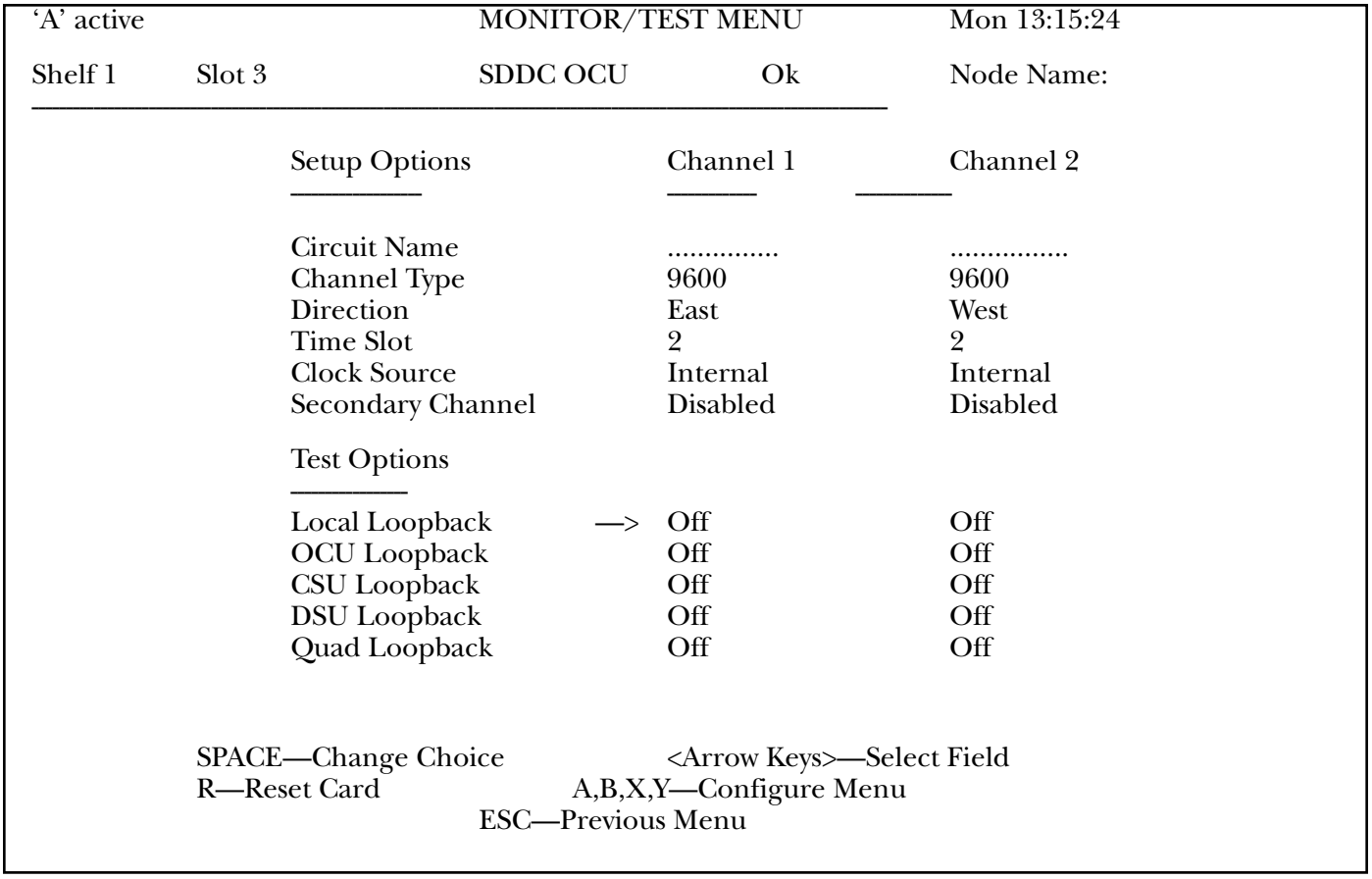


Fig. 10-17. Subrate DDC Monitor Menu.

The screen in **Fig. 10-17** displays the monitor and test information for the SDDC. The following parameters are provided:

- Circuit Name - An 8-character alphanumeric circuit name.
- Channel Type - The subrate DDC card operates at 9600 baud only.
- Direction - Selected T1 line (East or West).
- Time slot - Selected time slot of the channel.
- Clock Source - Selected external clock.
- Secondary Channel - Selected state enabled or disabled.

See **Fig. 10-17** for the following operator entries:

- Local Loopback - This field allows you to put the selected channel in and out of local loopback by using the space key.
- OCU Loopback - This field allows you to put the selected channel in and out of OCU loopback by using the space key.
- CSU Loopback - This field allows you to put the selected channel in and out of CSU loopback by using the space key.
- DSU Loopback - This field allows you to put the selected channel in and out of DSU loopback by using the space key.
- Quad Loopback - This field allows you to put the selected channel in and out of quad loopback by using the space key.

- Reset - Selecting R will reset the card. This is disruptive.
- Configure - Selecting A, B, X, or Y switches to the A, B, X, or Y configure menu for this card.

10.17 Dual Data Card Monitor/Test Menu

Use the menu shown in figure 18 to monitor and test the DDC card. You can access this menu through the following steps:

1. From the main menu, type **4** and press the Enter key.
2. When the screen for the Shelf Plug-in Assignment menu appears, enter the shelf and slot position you need, such as **1/9**. Press the Enter key.
3. When the DCC Monitor/Test menu appears, you can use the arrow keys to scroll through the test options. If you want to change an option, press the space key for another choice.

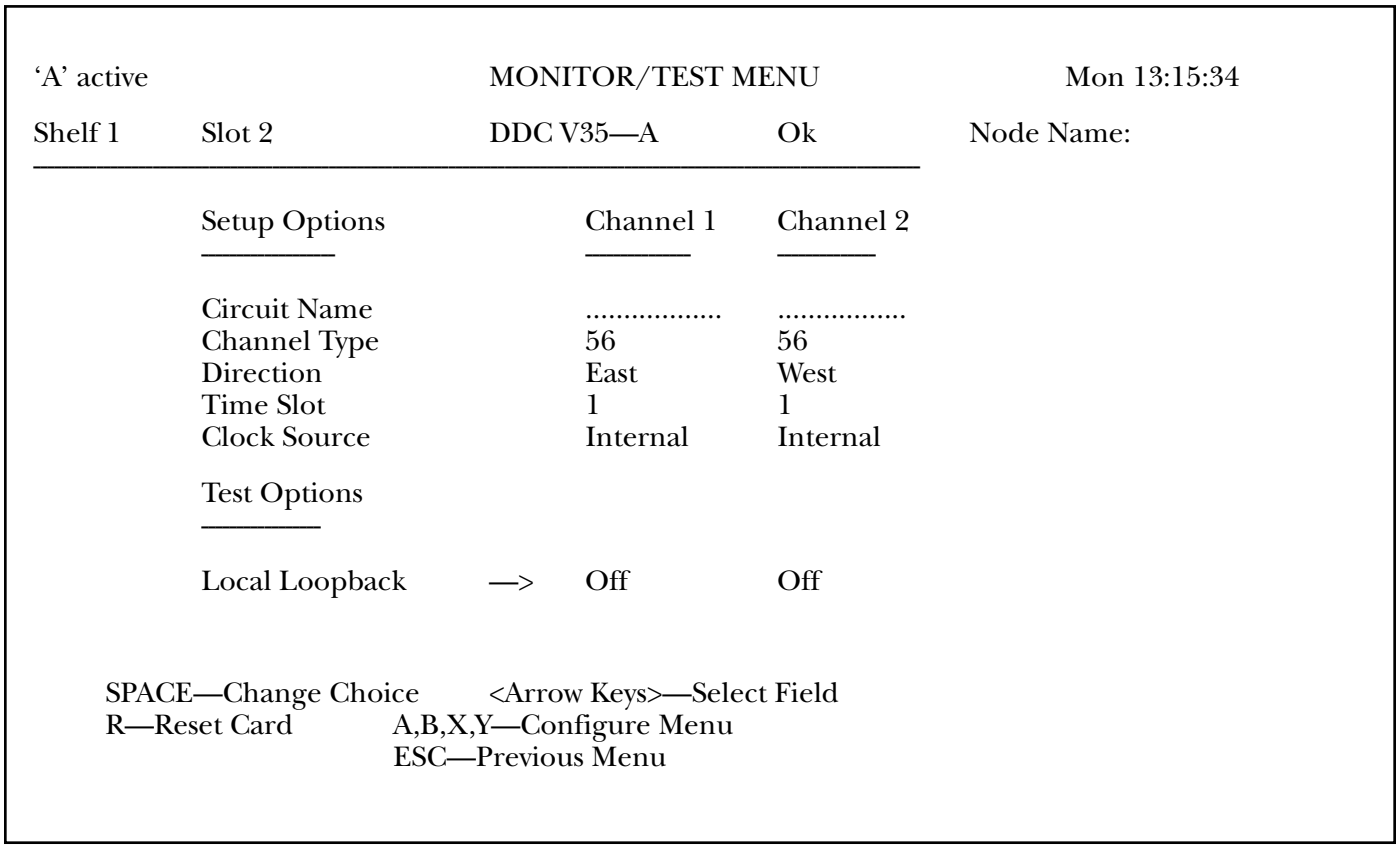


Fig. 10-18. DDC Monitor/Test Menu.

In **Fig. 10-18** these parameters are provided for the DDC:

- Circuit Name - An 8-character alphanumeric circuit name.
- Channel Type - The subrate DDC card operates at 9600 baud only.
- Direction - Selected T1 line (East or West).
- Time slot - Selected time slot of the channel.
- Clock Source - Selected external clock.

The fields of this screen are:

- Local Loopback - This field allows you to put the selected channel in and out of loopback by using the space key.
- Reset - Selecting R will reset the card. This is disruptive.
- Configure - Selecting A, B, X, or Y switches to the A, B, X, or Y configure menu for this card.

10.18 Dual Modem Monitor/Test Menu

Use the menu shown in **Fig. 10-19** to monitor and test DMC cards RS-232, RS-530, and V.35. Access the menu with these steps:

1. From the main menu, type **4** and press the Enter key.
2. When the screen for the Shelf Plug-in Assignment menu appears, enter the shelf and slot position you want to monitor or test, such as **1/11**. Press the Enter key.

```
'A' active                    MONITOR/TEST MENU                    Mon 13:13:27

Shelf 1      Slot 11          DMC   RS232        Ok          Node Name:
_____________________________________________________________________

Setup Options                 Channel 1      Channel 2      Tx1     Rx1          Tx2     Rx2
_____________                 _____________  _____________  ______  ___________  ______  ______

Circuit Name                  .....          .....          ST 0    SD 1         ST 0    SD 1
Direction                     East           West           RD 1    RTS 1        RD 1    RTS 1
Time Slot                     9              9              RT 0    TT 1         RT 0    TT 1
A/B Signaling                 Enabled        Enabled        DSR 1   DTR 1        DSR 1   DTR 1
Signaling                     FXS-LS         FXS-LS         CTS 1   RDL 1        CTS 1   RDL 1
Glare Resolution              Disabled       Disabled       DCD 1   SS 1         DCD 1   SS 1
Modem State                   Idle           Idle           RI 1    ALB 1        RI 1    ALB 1
                                                            SI 0                 SI 0
                                                            TM 1                 TM 1

Test Options
_____________

Local Loopback          -->   Off            Off            NTD 1   NRD 1        NTD 1   NRD 1
Net Loopback                  Off            Off
Quad Loopback                 Off            Off
External Test           Off                  Off

                        SPACE—Change Choice          <Arrow Keys>—Select Field
                        R—Reset Card                 A,B,X,Y—Configure Menu
                                                     ESC—Previous Menu
```

Fig. 10-19. Dual Modem Monitor and Test Menu.

3. When the DMC Monitor/Test Menu appears, you can use the arrow keys to scroll through the test options. If you want to change an option, press the space key for another choice.

The screen in **Fig. 10-19** displays the monitor and test information for the T1. The following information is displayed:

- Circuit Name - An 8-character alphanumeric field for establishing a circuit name.
- Direction - Selection of which T1 (East or West) the channel is assigned to.
- Time slot - Selection of timeslot a channel is assigned to.
- A/B Signaling - Enable or disable A/B signaling bits.
- Signaling Type - Select signaling type.
- Glare Resolution - Enable or disable glare resolution.
- Modem State - Indicates whether modem is idle, training, or connected.

The screen in **Fig. 10-19** allows for the following operator actions:

- Local Loopback - This field allows you to put the selected channel in and out of local loopback by using the space key.
- Network Loopback - This field allows you to put the selected channel in and out of network loopback by using the space key.
- Quad Loopback - This field allows you to put the selected channel in and out of quad loopback by using the space key.
- Reset - Selecting R will reset the card. This is disruptive.
- External Test - This field allows you to disable external tests that you have initiated.
- Tx1 Rx1/Tx2 Rx2 - Digital monitoring of signal leads. Tx1 and Rx1 identify signals for channel 1. Tx2 and Rx2 identify signals for channel 2.
- Configure - Selecting A, B, X, or Y switches to the A, B, X, or Y configure menu for this card.

10.19 Alarm Summary

The T1 Channel Bank provides a high degree of intelligence in the network. Depending on the failure, the backups (X or Y configurations) will switch on-line immediately. To discover what happened, you should view the alarm log. Major alarms are listed in **Table 10-3**, and minor alarms are in **Table 10-4**. **Table 10-3** is a summary of alarm indications which may be found in the status field in figure 14. All alarms for the are listed in **Table 10-5**. Call technical support if you need more assistance.

Table 10-3. Major Alarms

BLU	Blue alarm
CLA	Clear major alarm
RED	T1 Red alarm
TPA	TPA alarm
YEL	T1 Yellow alarm

Table 10-4. Minor Alarms.

CRS	Card reset
ES3	BER 1.0-E03 alarm condition detected
ES4	BER 1.0-E04 alarm condition detected
ES5	BER 1.0-E05 alarm condition detected
ES6	BER 1.0-E06 alarm condition detected
ES7	BER 1.0-E07 alarm condition detected
FCM	Front card missing
RCI	Rear card inserted
RCM	Rear card missing
VIO	Security violation

Table 10-5. Alarms.

Status Messages	Class	Status
BLU	Major	Blue alarm
CAX	Mandatory	On-line T1 failed. Configuration switch to X
CAY	Mandatory	On-line T1 failed. Configuration switch to Y
CFD	Mandatory	Forced configuration switch to B
CFD	Mandatory	Time of day configuration switch to A
CFN	Mandatory	Forced configuration switch to A
CFX	Mandatory	Forced configuration switch to X
CFY	Mandatory	Forced configuration switch to Y
CLA	Major	Major Alarm Cleared
CLX	Mandatory	Lost on-line T1 switch to X
CTN	Mandatory	Time of day configuration switch to A
CRS	Minor	Card reset
ES3	Minor	BER 1.0-E03 alarm condition detected
EC3	Mandatory	BER 1.0-E03 alarm condition cleared
ES4	Minor	BER 1.0-E04 alarm condition detected
EC4	Mandatory	BER 1.0-E04 alarm condition cleared
ES5	Minor	BER 1.0-E05 alarm condition detected
EC5	Mandatory	BER 1.0-E05 alarm condition cleared
ES6	Minor	BER 1.0-E06 alarm condition detected
EC6	Mandatory	BER 1.0-E06 alarm condition cleared

Table 10-5. Alarms (continued).

Status Messages	Class	Status
ES7	Minor	BER 1.0-E07 alarm condition detected
EC7	Mandatory	BER 1.0-E07 alarm condition cleared
FCM	Minor	Front card missing
LSF	Mandatory	T1 signal OK
LSN	Mandatory	Lost T1 signal
NLF	Exception	NLOOP cleared
NLO	Exception	NLOOP detected
RCI	Minor	Rear card inserted
RED	Major	T1 Red alarm
RCM	Minor	Rear card missing
TOF	Exception	Test mode off
TON	Exception	Test mode on
TPA	Major	TPA alarm
VIO	Minor	Security violation
YEL	Major	T1 Yellow alarm

10.20 MCC Monitor/Test Menu

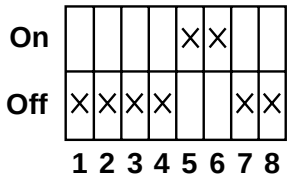
Use the menu shown in **Fig. 10-20** to display switch settings for the MCC card.

1. From the main menu, type **4** and press the Enter key.
2. When the screen for the shelf plug-in assignment menu appears, enter the shelf and slot position you need, such as 1/1. Press the Enter key.
3. When the MCC Monitor/Test menu appears, you can view the DIP switch configuration. However, there are no user options available. To change any switch setting, you must remove the MCC card and change the switch manually.

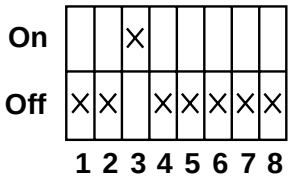
'A' active MONITOR/TEST MENU Thur 14:27:56

Shelf 1 Slot 1 MCC MCCNET Ok Mode Name: .....

Switch S1



Switch S2



4	5	6	MCC Baud Rate
On	On	Off	1200 Baud
Off	Off	On	2400 Baud
On	Off	On	4000 Baud
Off	On	On	9600 Baud
On	On	On	19200 Baud

	On	Off
1	Expansion Shelf	Standard Shelf
2	MCC Dominant	Chan Cards Dominant
3	Penril Test	Normal
4	Configured CB	Normal Mode
5	VT-52 Terminal	VT-100 Terminal

Switches 1,2,3,7,8 Not Used

6-8 Not Used

ESC - Previous Menu

ALT -2 FOR HELP | ANSI | HDX | 9688 N81 | LOG CLOSED | PRINT OFF | OFF-LINE

Fig. 10-20. MCC Monitor/Test Menu.

11. Setting Up System Network Timing Plan

11.1 Signal Flow

Fig. 11-1 is an overview diagram of the signal path flow illustrating both East and West T1 logic card sets. Traffic received on the East T1 is applied to the East T1 (Rx) Bus. This traffic is available for demultiplexing to channel cards assigned to the East T1. This traffic is also available to continue in the West direction through the E/W, D&I gate.

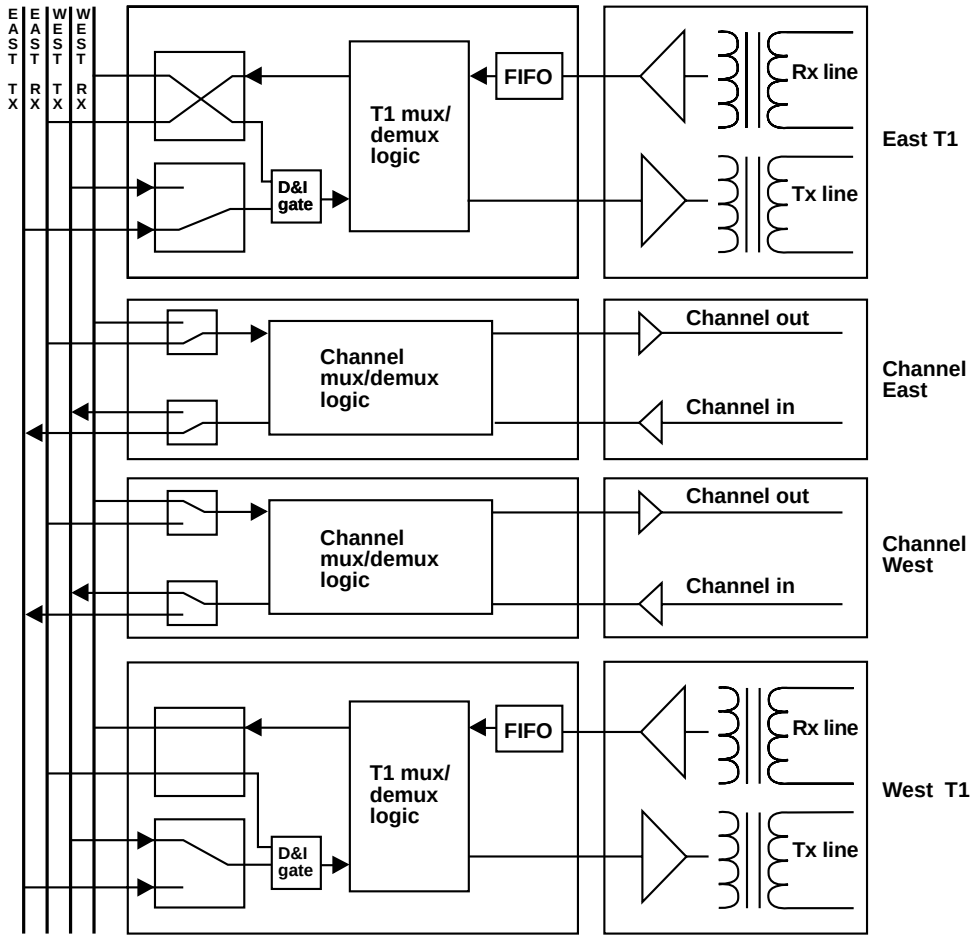


Fig. 11-1. Signal Path Flow.

The E/W D&I gate switches between Tx bus and its opposite assigned Rx bus for D&I operation. Channel input signals are multiplexed onto the Tx bus and transmitted to the appropriate T1 line through the T1 logic card.

Bus selection and drop-and-insert logic gates are illustrated in **Fig. 11-1**. The first set of gates select the operating T1 bus (East or West) at the time of configuration. They only change if the logic card is re-configured to the opposite T1 bus. The second gate dynamically switches allowing DS0(s) received from one T1 to be passed directly to the transmit of the opposite T1.

11.2 System Timing Plan

To set up a D&I application that is connected to a POP, connect the POP to the East side. For a chassis with D&I and East and West T1s, the East direction is always connected to the master clock source. **Figure 11-2** is an overview of the system timing plan. The T1 Channel Bank uses a synchronous plan. The East T1 Logic card establishes timing for the entire shelf. Removal of this card will result in the West card falling back on its local voltage control oscillator (VCO) when it is configured for internal timing.

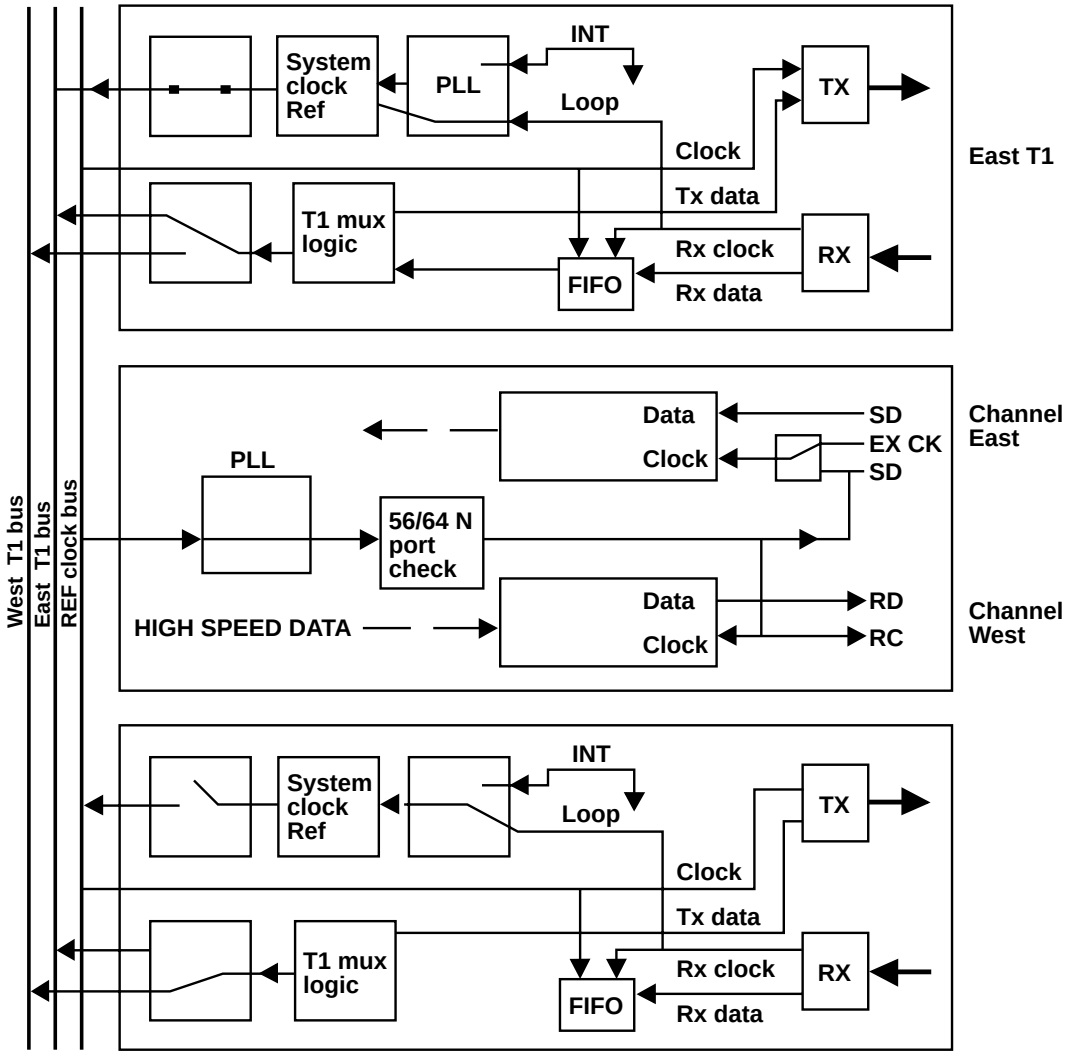


Fig. 11-2. System Timing Plan.

11.3 Choice of Clocks

The T1 Channel Bank allows you to clock from more than one source, either internal or looped. It can use two clock sources: internal and composite. The standard The T1 Channel Bank uses a stratum 4 built-in internal clock for a reference clock in the network. This oscillator is not stable enough to be used for some purposes, but it could be used by itself if necessary. If you connect the T1 to a CSU in a network, you can derive the clock source from the CSU itself. Most of the time you will use the composite clock source.

11.4 Split Shelf Timing Plan

Fig. 11-3 is an illustration of the timing plan for the split shelf. The backplane arrangement allows you to have separate timing for the East and for the West. The split shelf timing allows you to process voice and data, but it is not possible to have drop and insert.

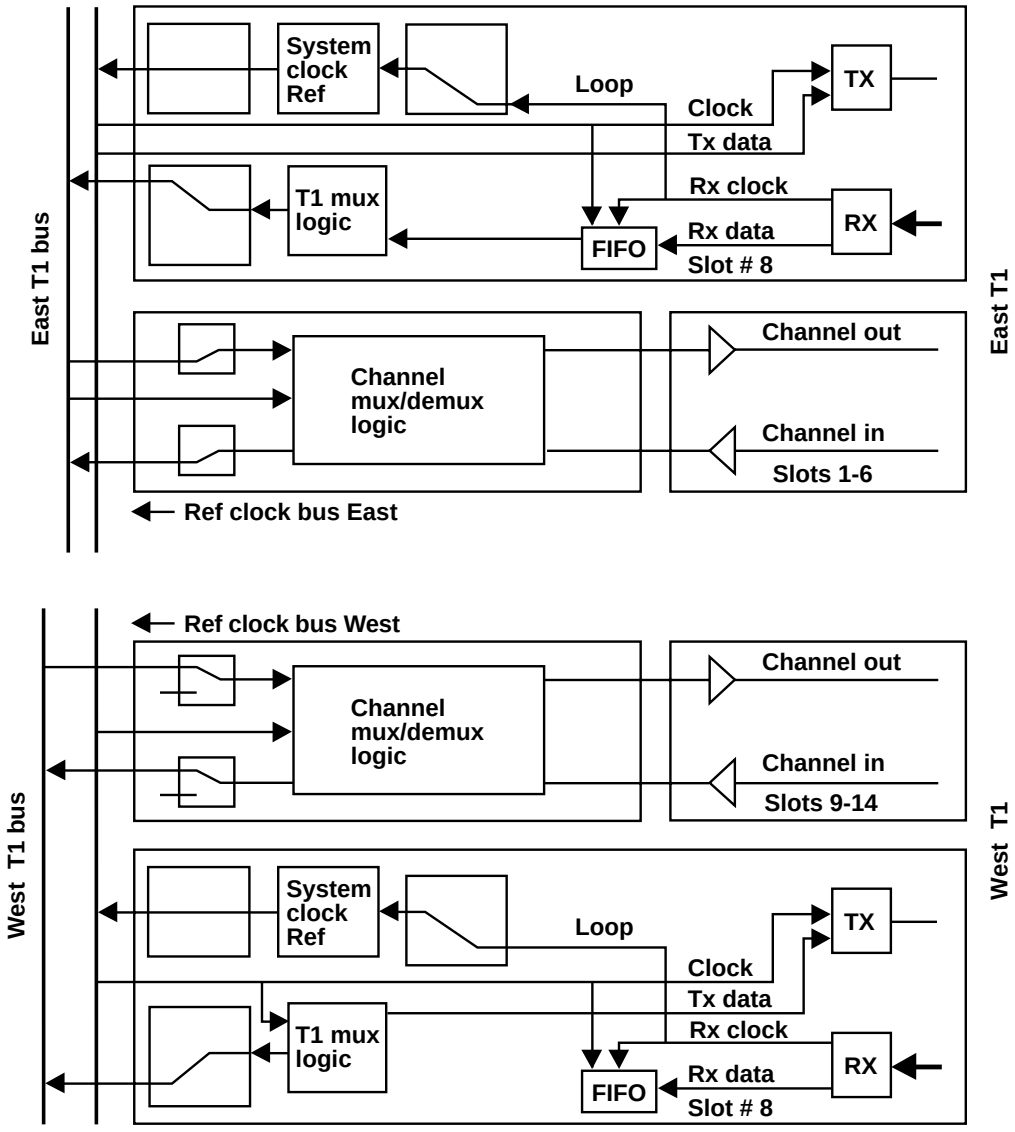


Fig. 11-3. Split Shelf Timing Plan.

11.5 Compensating for Jitters and Clock Phase

The receive T1 clock and data signal from the rear plug-in interfaces a 2-frame FIFO buffer that is designed to compensate for jitter and clock phase. See **Fig. 11-4**. The output is synchronous with the system clock. Thus, the system clock must be synchronous with the incoming T1 signal. This is accomplished in three ways:

1. The system clock slaves to the receive signal.
2. The far-end unit slave is set up to receive timing.
3. The system is implemented in a controlled synchronous network.

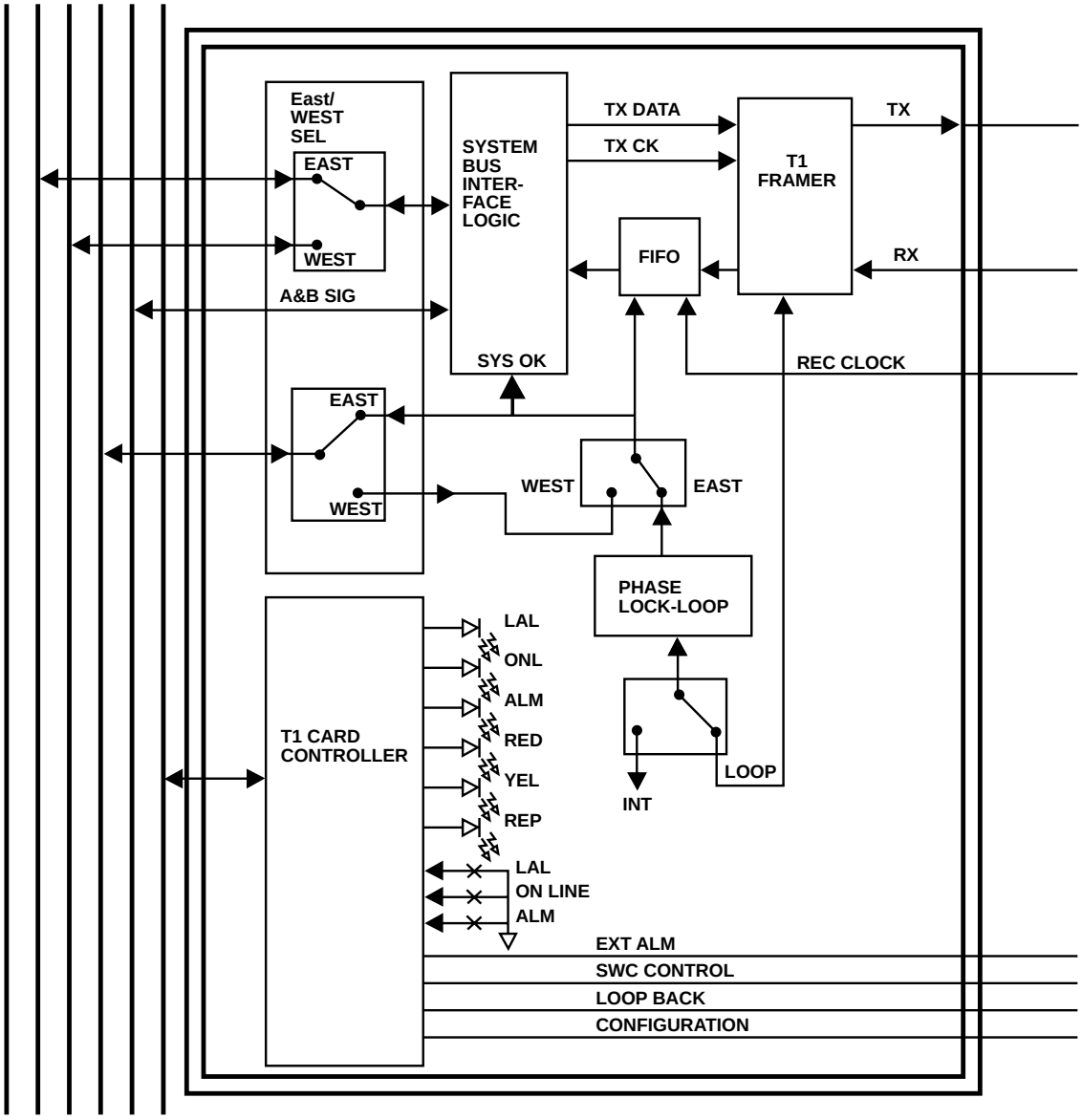


Fig. 11-4. Front Plug Assembly T1 Logic Diagram.

11.6 Timing Notes for Specific T1 Applications

Example 1: 800 or Long-Distance Service

1. Clocking is provided by the carrier (**Fig. 11-5**).
2. Set the T1 Channel Bank to loop timing.

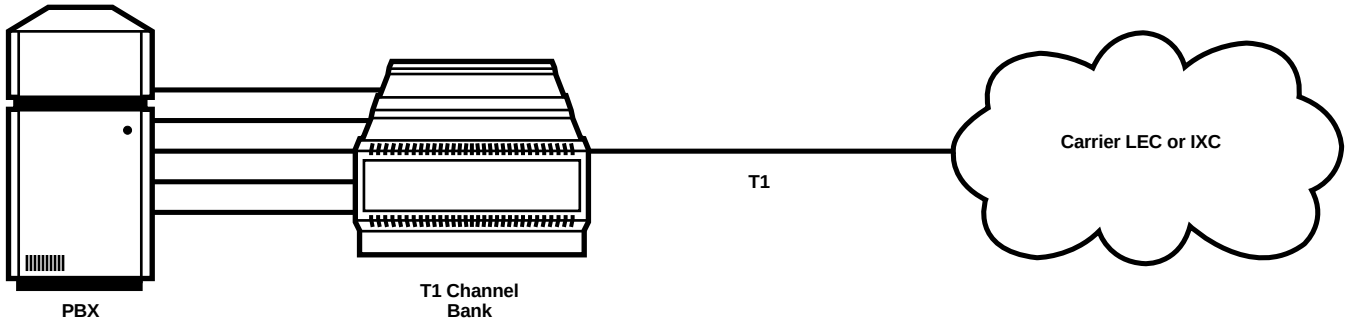


Fig. 11-5. Timing for Long Distance Service.

Example 2: Private Line Drop and Insert

See **Fig. 11-6**, which shows T1A as the private line that is not being supplied with timing. If you install equipment as shown in **Fig. 11-6**, it will NOT function.

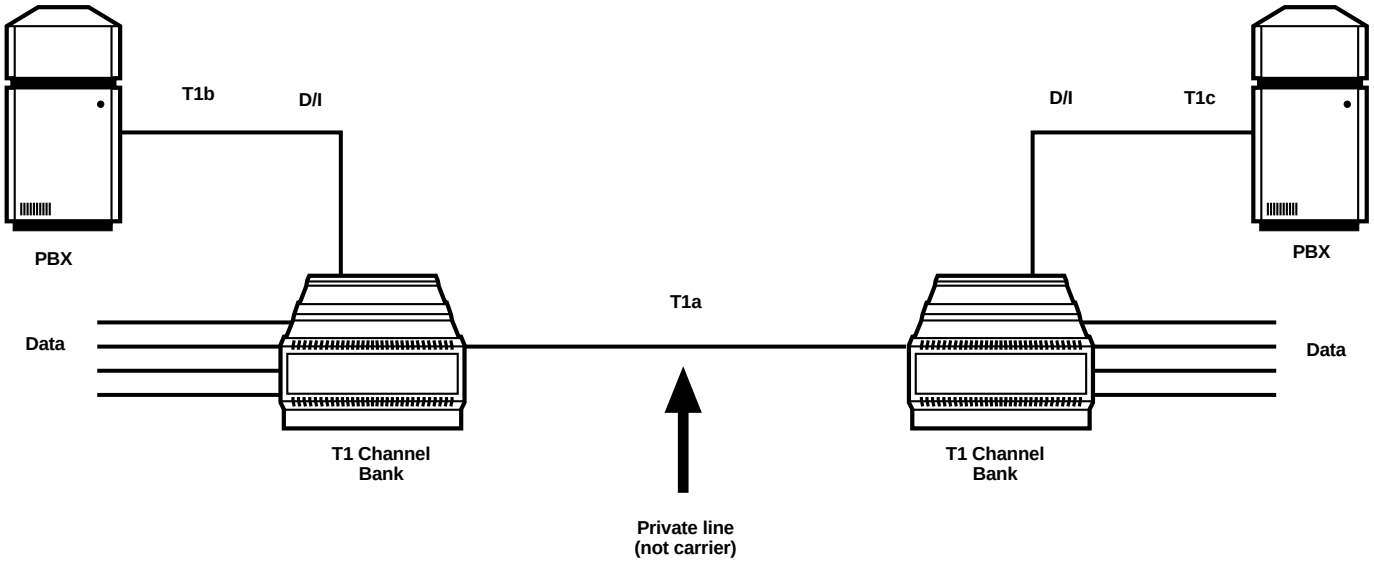


Fig. 11-6. Installation Will Not Function Properrly.

To ensure that clocks stay in frame, you must place DACS some where in the circuit. See **Fig. 11-7** and follow the steps below to rectify the problem.

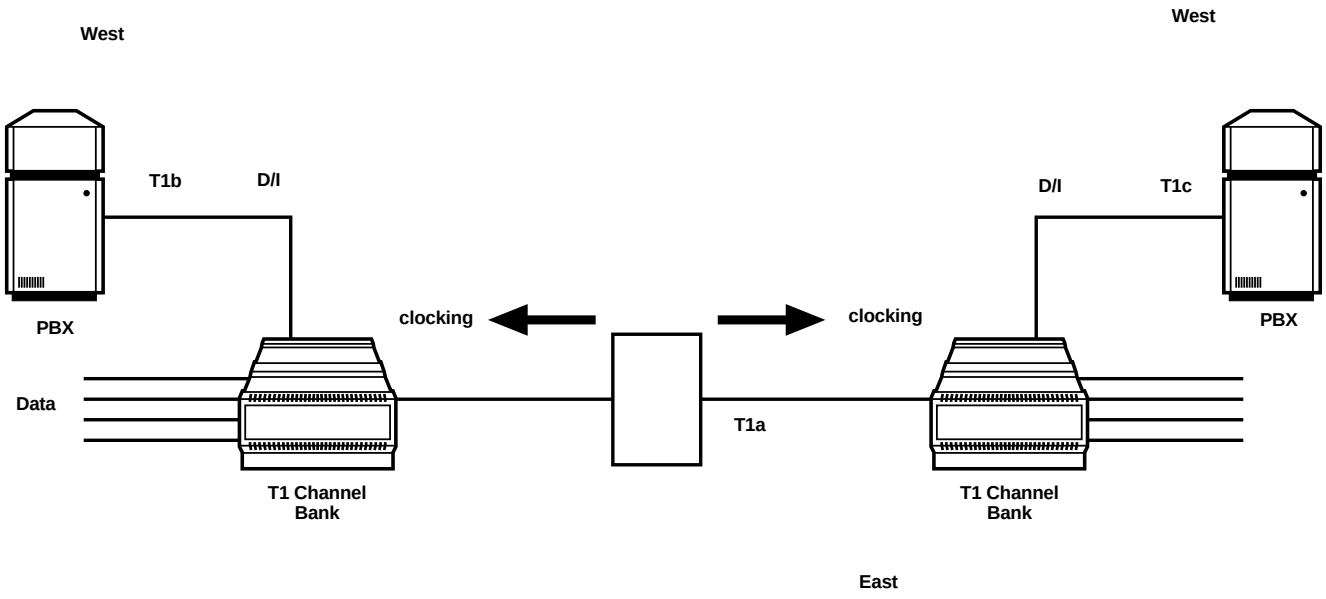


Fig. 11-7.I nstallation Will Function Properly.

1. Verify that the private line is not being supplied with timing.
2. Place DACS somewhere in the circuit.
3. Set timing on to loop.
4. Set all data timing on (i.e., V.35 card, 4 wire AD card, etc.) at internal.
5. Set timing on T1b and T1c to loop. T1a should be East side. T1b and T1c should be West side.

Example 3: Network Timing

This application allows for the timing to be provided by the carrier. Set all to loop timing.

All equipment attached to the s receives timing from the ports. See **Fig. 11-9**. In this figure, the New York should be a split midplane model.

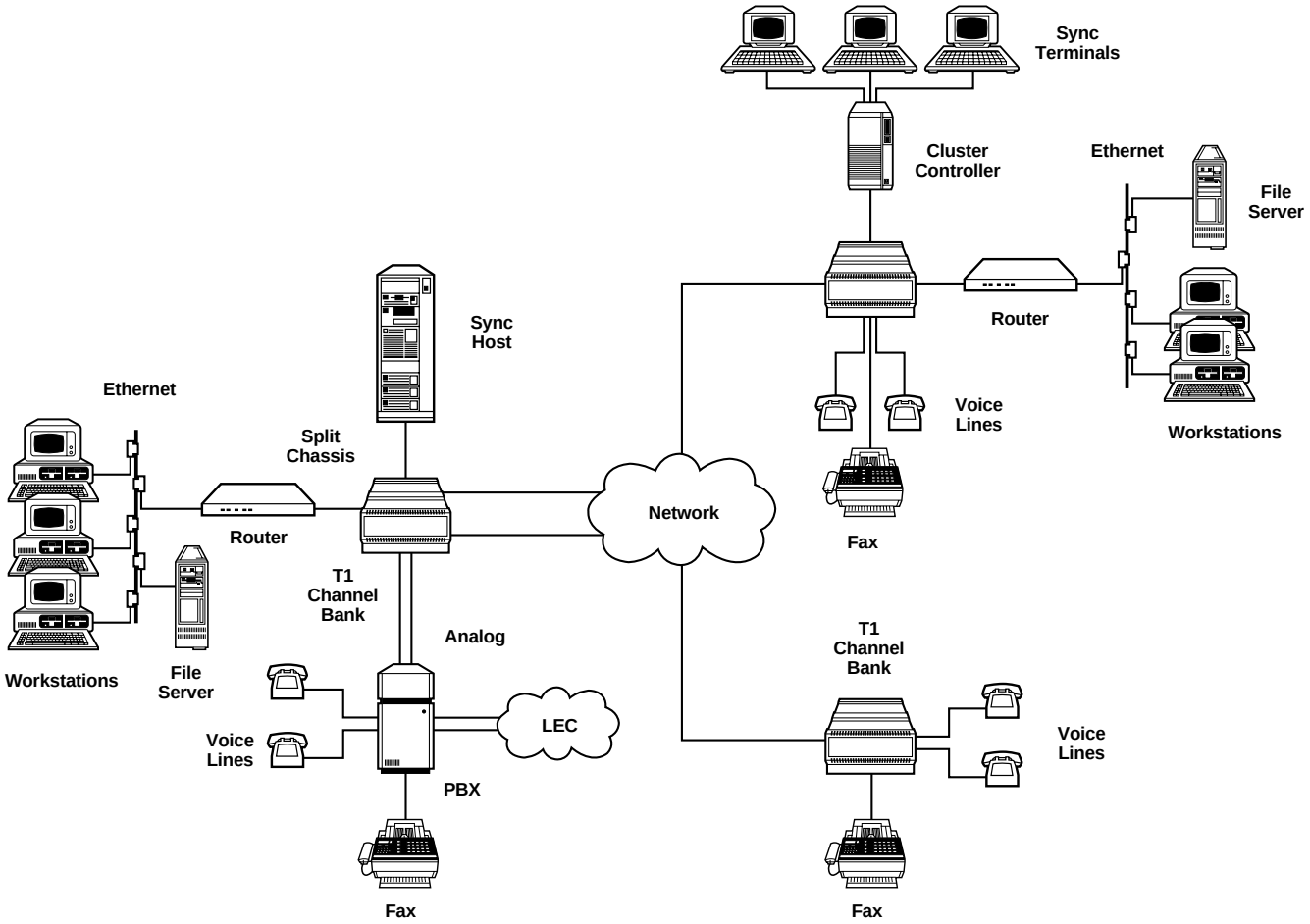


Fig. 11-8. Timing for Networks.

Example 4: Point to Point

When you lease a T1 circuit between two locations, timing should be provided by the carrier. See **Fig. 11-9**.

Set both Channel Banks for loop timing.

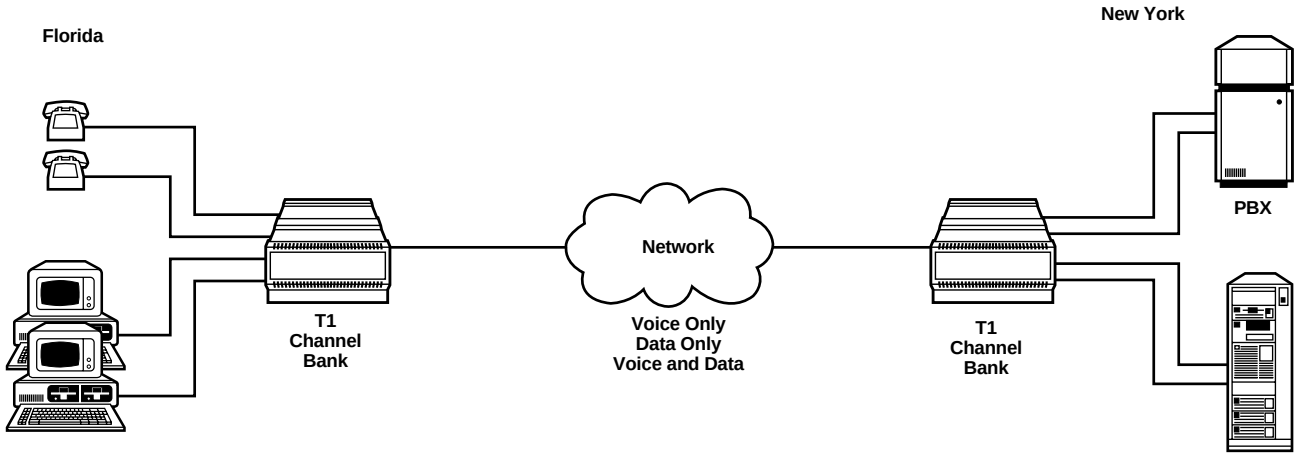


Fig. 11-9. Timing for Point-to-Point.

12. Testing and Troubleshooting

Once you have configured the T1 Channel Bank, you can now test and monitor the system.

12.1 Verifying Correct Operation

After you turn on the system and it boots up, you know it is on-line when the ONL LED stays on as a solid green light.

To verify operation while disconnected from the T1 line:

1. Push in the LAL switch button on the front of the T1 card.
2. Hold in the black button until the T1 light starts blinking.
3. Wait 15-20 seconds. You should see all the channel lights come on to verify that they are programmed correctly and that they are working.

NOTE

You can also accomplish the same operation as described above by performing a hard-wire loopback of the T1 interface—use a loopback plug which jumpers pin 1 to pin 3 and pin 9 to pin 11 of the T1 rear plug assembly connector.

12.2 Changing a Configuration

You can only change configurations by escaping out of the shelf plug-in assignment/time slot assignment menu to the main menu using the Esc key.

1. You can configure by selecting (5) Configure Plug-ins from the main menu.
2. After you make your edits, use the Esc key to return to the main menu. At this time the MCC asks if you want to write these to EEPROM (Y/N). If you type **Y**, then the plug-in units are changed to the new configuration just edited. If you answer **N**, no changes will be written to the EEPROMs.

NOTE

When a card fails or is replaced into the same slot, no reconfiguration is required.

If you look in the back of the chassis, it is easy to see if the cards are placed correctly by looking at the LEDs.

- If the green LED comes on and stays on, it means that the back card matches the front card.
- If you put a rear card in the wrong slot, the green LED will blink.
- If you put a rear card in a slot where there is no front card installed, the LED will be off.

12.3 Configuration Conflicts

When there is a configuration conflict, a warning message is displayed in the status field of the assignment menus. Also, the MCC will not permit the conflict to be initiated and the old configuration will remain the active one. Conflicts are:

- Two channels assigned to the same time slot.
- Two T1 cards assigned to the same status (primary or secondary).
- Two T1 cards on line simultaneously assigned to the same T1.

12.4 Troubleshooting Alarms

If alarms come on, what you do next often depends whether your setup is point-to-point or whether you are connected to a long-distance carrier (POP).

If Connected to a Long-Distance Carrier

- Check to ensure the timing is set to the specs the carrier has given to you.
- If not, work with the long-distance carrier's technician to ensure that the timing is set correctly.

Verifying Presence of a Bad T1 Card

1. If the alarm does not go away in 15-20 seconds and the solid green light does not come on, then do a hardwire loopback test on the T1 card by shorting pins 1 and 3 together and pins 9 and 11 together on the back of the T1. There is also a loopback test provided by the T1 card itself.
2. If you put the same plug on the CSU (1 and 3 and 9 and 11), you can loop the CSU back. See figure 1.
3. Put the remote CSU in loopback to verify the circuit and equipment.
4. Repeat steps 1-3 from the distant end mux.

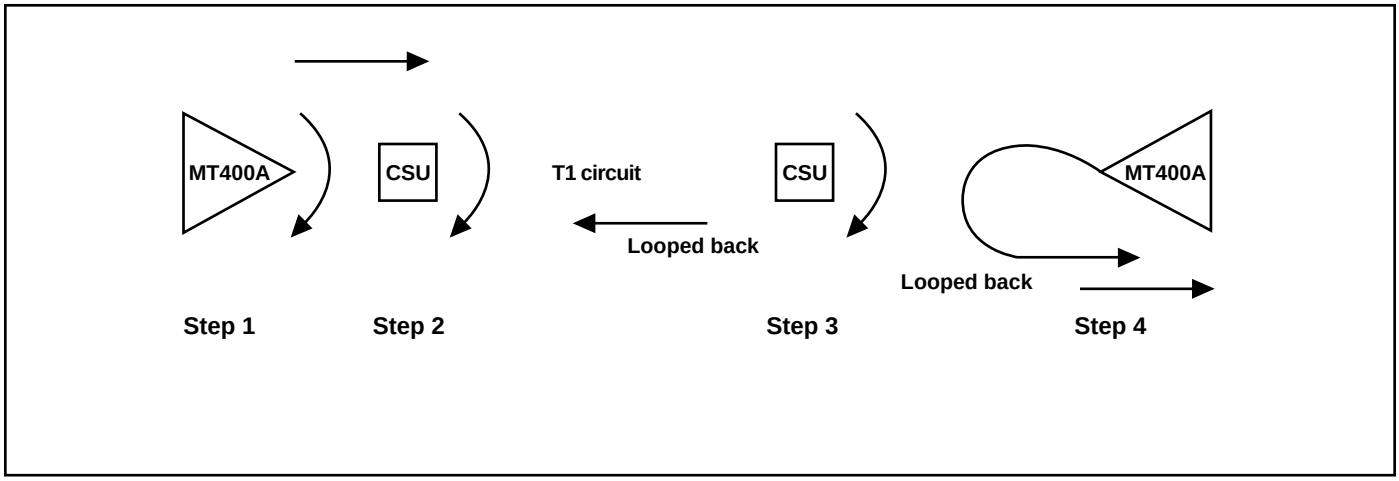


Fig. 12-1. Direction of Loopbacks.

12.5 Testing for Tone Levels

During installation, it is necessary to test for adjusting tone levels and losses. Use the levels shown in **Fig. 12-2**.

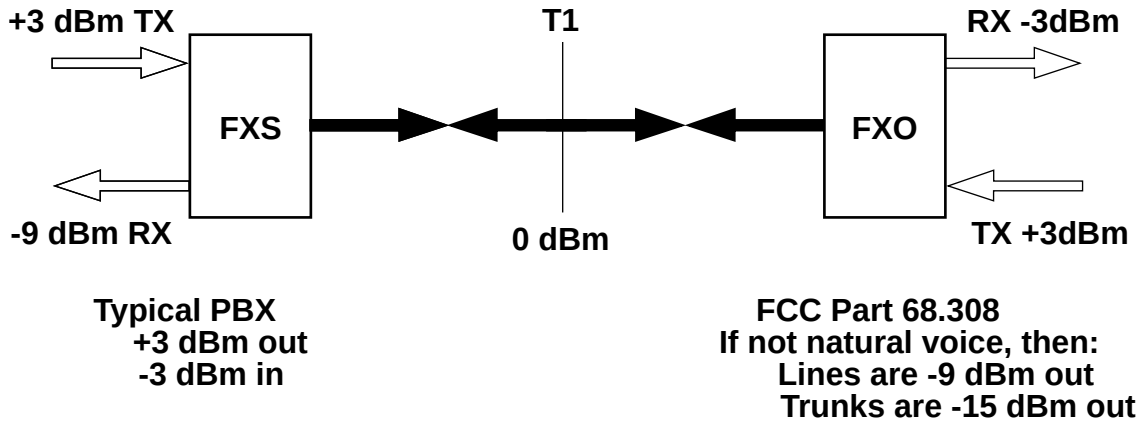


Fig. 12-2. PBX Tone Levels.

12.6 Testing the E&M Cards

This test procedure is for the 4-wire E&M. Use this for the following PBXs: Horizon, Dimension, System 85, and System 75. While testing the 4-wire E&M from a PBX, keep in mind that some PBXs hunt sequentially for a trunk, and others do a random selection. This means that you could dial the trunk group (4-wire E&M) from the PBX, but it might not be the first trunk in the group even if no one else is using the PBX. You might have to look for the trunk while you are testing.

PBXs Direction of Signals

- M — out of the PBX
- E — into the PBX
- T&R — into the PBX
- T1&R1 — out of the PBX

4-Wire E&M Card in the T1 Channel Bank

- M — into the channel card
- E — out of the channel card
- T&R — into the channel card
- T1&R1 — out of the channel card

Table 12-1. Pinouts.

1	E lead	5	T
2	M lead	6	R1
3	T1	7	EG
4	R	8	MB

Test Procedure

To test the function of the E&M lead from the PBX, follow these steps—

1. Disconnect the E&M leads from the PBX and the channel bank 4-wire E&M card.
2. Place a voltmeter from the M lead of the PBX to the ground. With the PBX trunk at idle, there should be no reading. PBX places the M lead at ground.
3, When the PBX seizes the E&M trunk, the M lead from the PBX should go to -48 VDC.
4. The M LED on the PBX card should come on when the trunk is seized.
5. With the E&M leads connected to the channel bank at both ends (when the M LED comes on at the side where the trunk is seized), the E LED will come on at the far end.
6. Notice that the when the trunk is idle, the E lead will be open.
7. Notice that when the trunk is seized at A, the E lead at B will go from open to ground.

13. Post-Installation

Routine Maintenance

Once your T1 Channel Bank has been installed, you only need to give it a periodic cleaning. Use a damp lint-free cloth to remove smudges, finger prints, or dust that accumulates on the case or face-plates.

If you do not sign up for a maintenance contract for the hardware, then keep at least one extra T1 card on the premises as a spare. You must turn off the system in order to pull the T1 card out. The T1 card supplies the clock to other cards in the system, and unless the T1 is on and functioning properly, the others will not function properly. After you change the T1 card, turn the system on again.

You can change the voice and data cards with the system still running. Removal and installation of channel cards can cause noise on other circuits. Select your time to replace cards accordingly.

Appendix A: Glossary

A

Access rights of 1 — Access rights for monitoring only.

AD — Analog to Digital

Address — A set of numbers that uniquely identifies something such as a workstation in a LAN, a packet of data traveling through a network, a location in computer memory. The location of a terminal, a peripheral device, a node, or any other unit in a network.

AGC — Automatic Gain Control

Aggregate input — The sum of all data rates of the terminals (or computer ports) connected to a multiplexor.

AMI (Alternate mark inversion) — Every other 1 gets inverted in a bipolar stream.

Analog — A varying, non-discrete function, usually applied to electronic signals. An analog function can take any value within a given range, and changes value with a smooth transition. It is the opposite of a digital signal, which jumps from one discrete value to another.

ANSI (American National Standards Institute) — A voluntary organization that helps set standards and also helps the U.S. in the International Standards Organization (ISO).

ASCII (American Standard Code for Information Interchange) — A way of encoding characters into binary (on/off) bits. A 7-bit (plus parity) code used for data transmission, established to maintain compatibility between data services.

Asynchronous — A method of transmitting data, a low-cost alternative to synchronous communications because it does not require the sender and the receiver to each have a "clock" to time each other to stay in "sync." Each character is individually synchronized, usually by the start and stop bits. The timing information is in the transmitted character, rather than by a separate clocking signal.

ASDS (ACCUNET Spectrum of Digital Services) — A fractional T1 service tariffed by AT&T.

AT command set — The auto-dialing comand-set standard for most Bell 212A full-duplex dialup modems. The command set refers to a specific set of ASCII characters that may be sent to the modem for control purposes. An ASCII "AT" must precede each command.

Attenuation — The difference between transmitted and received power due to loss through equipment, lines, or other transmission devices. Usually attenuation is inherent to a transmission line, because of impedance factors. A certain amount of loss is usually expected (and sometimes required) by error-correcting circuitry in devices such as modems. If loss is not present, it can be inserted.

B

Bandwidth — The difference, expressed in Hertz (Hz or cycle per second), between the highest and the lowest frequencies of a transmission channel. The range of frequencies that can pass over a given circuit. Usually, the greater the bandwidth, the more information that can be sent through the circuit at a given amount of time.

BERT (Bit Error Rate/Ratio Testing) — Testing a data line with a pattern of bits that is compared before and after transmission.

Binary digit (Bit) — A numeral within the binary number system. The Binary Digit may be at either of two states: zero (0) or one (1), on or off, high or low, yes or no.

Bit rate — The rate at which data bits are transmitted over a communication path, normally expressed in bits per second (bps); not to be confused with the data signaling rate (baud), which measures the rate of signal changes.

Bit 7 stuff — In line code, B7ZS inserts a 1 in bit 7 of a voice time slot that contains all zeros in bits 1-8.

bps (bits per second)— The basic unit of data communications rate measurement.

BER (Bit Error Rate) — The ratio of incorrectly received data (bits) to the total amount of data transmitted.

BG — Battery ground.

BPV — Bipolar violation. Two successive bits with the same polarity.

Bus — Connective link between multiple processing sites, connected in parallel and shared by users; sites can transmit data only one way at a time. Involves some sort of contention-control mechanism for accessing bus transmission medium.

Bypass D&I — A relay that connects East and West span together if the chassis fails.

Byte — A set of contiguous bits constituting a discrete item of information. Usually six or eight bits long.

B8ZS (Bipolar 8 Zero Substitution) — In line code, B8ZS transmits a specified BPV code on the T1 line if 8 zeros are detected. This is referred to as a clear channel capability.

C

Carrier — Public/common provider of communications facilities to provide transmission of voice and data from one point to another over a telecommunications network. Examples: AT&T, Sprint®, MCI®.

CCITT (Comite Consultatif International Telegraphique et Telephonique) — International consultative commmittee for telephone and telegraph standards, based in Geneva, Switzerland.

CGA (Carrier Group Alarm)

Channel — 56 or 64 Kbps PCM.

Channel bank — Communication equipment used for multiplexing voice-grade channels into a digial transmission signal (typically, 24 channels in US, 30 in Europe).

Character parity — Adding overhead bit to a character code to provide error-checking.

Circuit — The complete electrical path between terminals over which telecommunications are provided. A network of circuit elements (logic gates, transistors, capacitors, etc.) used to perform a specific function.

Clear channel capability — Ability to use all 64 kbps or N x 64 user data. This requires ESF framing and B8ZS line coding.

Clock — A device for timing events. In data communications, you need a clock to control the timing bits sent in a data stream and to control the timing of the sampling bits received in a data stream.

Cloud — The public network, called a cloud because a user can connect at one point on it and expect data/voice input to pass through to the other side and merge in the proper sequence and format.

CODEC (Coder/Decoder) — An integrated circuit that performs specific analog-to-digital conversion.

Communications facility — Communications circuit usually provided by the common carrier.

COM Port— The interface through which the computer connects to its communication channel. Time-sharing computers can be equipped with a variety of ports that matches the various communications services and connected terminal devices.

Composite link—The line of circuit connecting a pair of multiplexers or concentrator; the circuit carrying the multiplexed data.

CPU—Central Processing Unit

CRC—Cyclic Redundancy Check

CSU (Channel Service Unit) — A component of customer premises equipment (CPE) used to terminate a digital circuit, such as DDS or T1, at the customer site. Performs certain line-conditioning functions, ensures network compliance per FCC rules, and responds to loopback commands from central office.

CTS (Clear to send —An RS-232 signal generated by the DCE indicating that the DCE (modem or mux) is ready to transmit data.

D

D4 — T1 framing technique dividing T1 into 24 channels, a D4 frame being 192 bits X 8000 = 64 Kbps, or a DS0. D4 allows continuous monitoring and non-destructive diagnostic framing to be implemented by the carrier.

DACS (Digital Access and Cross-connect System) — A digital cross-connect switch.

Data — Digitally represented information, which includes voice, text, facsimile, and video.

Data link — A connection between two computers over a phone line.

Data rate — The maximum number of bits or information that can be transmitted per second.

Data Set Ready — RS-232 control signal indicates that a modem is ready to transmit data.

DCD—Data Carrier Detect

DCE (Data Communication Equipment) — The equipment that helps the DTE communicate over the network by providing the necessary coding or conversions. It establishes, maintains, and terminates the connection in a data conversation.

DDS (Dataphone Digital Service) — A trademark of AT&T to identify a private-line service for digital data communications.

Dedicated line — A leased telephone line, reserved for the exclusive use of one customer.

Digital Data Service Unit (DSU) — A device used for the connection of a high-speed data line with a common carrier line.

Diagnostics — Tests used to detect malfunctions in a system or component. Diagnostics aid the troubleshooter in locating and correcting specific problems.

Digital — Encoded as either a binary 1 or 0. In data communications, the description of the binary output of computer or terminal. Muxes or modems convert the digital signals into waves for transmission over conventional telephone lines.

Digital loopback — Technique for testing digital processing circuitry of a communications device. May be initiated locally or remotely via a telecommunications circuit. Device being tested will echo back a received test message after first decoding and then re-encoding in the results of which are compared with the original message.

DLF (Data Link Facility) — 40,000 bps bandwidth, a part of ESF type framing.

DS1 — A level 1 digital signal, 1.544 Mbps.

DS0 — Individual time slots that are assigned circuit numbers by the common carriers. A level O digital signal (64 Kbps); for example, a D4.

DSR—Data Set Ready

DSU—Digital Service Unit/Data Service Unit

DSX—Digital Signal Cross connect

DTE (Data Terminal Equipment) —The equipment at the end points of a communication link. Examples: a computer, a printer, a modem, a teletype, or a PBX.

DTR (Data Terminal Ready) — An RS-232 interface control signal which indicates that the terminals are ready for transmission.

Dumb terminal — A workstation that does not have internal (or local) processing/storage and cannot do much with the data you give it. It is usually just a keyboard and a screen. Typically does not use a data-transmission protocol, and sends one character at a time.

E

Encoding/decoding — Process of reforming information into a format suitable for transmission, and recovering it after transmission. For PCM, the generation of digital signals to represent quantized samples and the subsequent reverse process.

EPROM (Erasable Programable Read-Only Memory)— A computer chip or set of chips designed to store data (normally instruction code) that is frequently used. Memory that is initially programmed by the manufacturer. These chips do not lose their memory when the electricity is turned off. However, if they need new memory, you often have to return them to the factory to be reprogrammed.

EEPROM—Electrically Erasable Programmable Read-Only Memory

E&M (Ear and mouth) — The receive and transmit leads usually used between PBXs to signal on-hook and off-hook conditions. 2-state voltage.

EIA (Electronic Industries Association) — U.S. trade organization that issues its own standards and contributes to ANSI. It is responsible for the development and maintenance of industry standards for the interface between data processing machines and data-communications equipment.

ESD —Electrostatic Discharge

ESF (Extended Superframe Format or Extended Superframe) — This framing pattern indentifies a 24-frame sequence. This allows terminal equipment to rob bit 8 in frames 1, 6, 12, and 18 for telephone signaling information. The frame pattern is further time divided into a framing sequence pattern. ESF has a 4000-bps data channel (data-link facility).

Error rate — The ratio of incorrectly received data (bits, elements, characters, or blocks) to the total amount of data transmitted.

EXT CK — External clock.

F

Facility — A communications link or circuit.

FDX (full duplex) — Simultaneous communication between two points in both directions.

FIFO (First In First Out) — Mode of access in computer memory.

Four-wire circuit — A transmissions path which employs two separate electrical paths: one receiving and one transmitting.

Fractional T1 service — This service uses the N x DS0 portion of the T1 bandwidth, a service where the carrier only charges for the 64 Kbps resources used between cities. Examples: ASDS (ACCUNET Spectrum of Digital Services), tarriffed by AT&T.

Frame — A group of bits sent over a communications channel, usually containing its own control information, including address and error detection. The exact size and frame compositon depends on the protocol used.

Frequency — The number of times an elecromagnetic signal repeats an identical cycle in a unit of time, usually one second. One Hertz (Hz) is one cycle per second; a MHz is one million cycle per second.

Full duplex — Simultaneous two-way, independent communications in both directions.

FXO (Foreign Exchange Office) — Office-end applications.

FXS (Foreign Exchange Subscriber) — Station-end applications.

FX (Foreign exchange) — Circuits.

FPA (Front Plug Assembly) — Front card for the channel bank.

G

Glare — Two ends of a trunk seizing at the same time.

Groom — Efficient allocation/assignment of DS0s on the T1 by combining voice and data together to send on the same T1.

H

Half duplex (HDX)— Communication line using protocol capable of transmitting in either direction, but only one direction at a time.

Handshaking — Also known as Control Signal Sequencing, a procedure performed by DCEs or DTEs to verify that communications have been established and can proceed. There is also an alarm handshaking process on the T1.

HD2, 3, 4, etc — Header 2, 3, 4, etc.

Hertz — Synonymous with cycles per second: a unit of frequency that tells the number of cycles or complete waves that pass a reference point per second. One Hertz (Hz) is equal to 1 cycle per second.

High frequencies — Frequencies from 160 MHz to 400 MHz, designated for the forward direction in a mid-split system.

HSDC—High speed data channel

I

IADS—International ACCUNET Digital Service

IBR (Intermediate Bit Rate) — 64, 128, 256, 384, 512, or 768 Kbps.

IEEE (Institute of Electrical and Electronic Engineers) — An international professional society based in New York that issues its own standards and is a member of ANSI and ISO.

Interleaving — To arrange parts of one sequence of things or events so that they alternate with parts of one or more sequences of things or events in which each sequence retains its own identity.

Intelligent terminal — A programmable terminal.

IOC—Inter-office channel

I/O—Input/Output

ISDN—Integrated Service Data Network

ISO (International Standards Organization) — An organization based in Geneva, Switzerland, that creates, controls, and publishes standards.

ISO OSI (International Standards Organization's architecture for Open Systems Interconnection) — A scheme for a universal standard architecture and protocol.

ITDM — Intelligent Time-Division Multiplexor. A multiplexer that assigns time slots on demand rather than on a fixed subchannel-scanning basis.

IXC—Inter-exchange carrier

J

Jitter — Analog-communication line distortion caused by a signal's variation from its reference timing position, which can cause data-transmission errors, particularly at high speeds. This variation can be in amplitude, time, frequency, or phase.

JP1—Jumper Plug 1

K

K — One kilobyte, or 1024 bytes.

Kbps (Kilobits per second) — 1000 bits per second, a basic unit of measurement of data transmission speed.

KTU (Key Telephone Unit) — Telco utility standard shelf spacing. The spacing between the holes on the rack bars that is reserved for future telephone equipment.

L

LAL—Local Analog Loopback

LAN (Local Area Network) — A network to interconnect a variety of data terminal equipment within a limited geographical area. LANs do not use common carrier circuits ,although they may have gateways or bridges to other public and/or private networks.

Latched status — An alarm state noted on the screen. Once the operator has acknowledged the alarm or it has cleared on its own, a key must be pressed to unlatch it and for the OK status to reappear on the screen.

LEC (Local Exchange Carrier).

LED (Light-Emitting Diode) — A semiconductor device that emits light when current flows through it.

LDL (Local Digital Loopback) — A circuit that provides a loopback in both the T1 and the channel interface direction.

LL (Local Loopback) — A loopback performed by the locally installed equipment.

Logical port — Anything that connects to or can be connected to, such as a trunk line, an asychronous port, a path name, or a character string.

Loopback — A type of diagnostic test in which the transmitted signal is returned to the sending device after it passes through a data-communications link or network. This permits a built-in diagnostic circuit to compare the returned signal with the transmitted signal. If something is wrong with your equipment, you can do loopbacks excluding one piece of equipment after another until you logically figure out what is malfunctioning. Loopbacks can be performed on data in either an analog or a digital state.

Loopback tests — A test procedure in which signals are looped from a test center through a multiplexor, modem, or loopback switch and back to the test center for measurement.

LSO—Local Servicing Office

M

m (Milli) — Designation for one thousandth.

MB—Megabyte— 1,048,576 bytes or 1024 KB, a basic unit of measurement of mass storage.

Master clock — The source of timing signals, or the signals themselves, which all network stations use for synchronization.

Mbps (Megabits per second) —Millions of bits per second; measure of the signaling rate of a data link.

MCC (Monitor, Control, Configure) — The network managment card that works with the T1 Channel Bank..

MEGACOM — AT&T MEGACOM 800 service for large WATS customers.

MNP (Microcom Networking Protocol) — An error-correcting protocol for modems. Operates only point-to-point and does not have easy connections to X.25 and ISDN technology.

Modulation — The process by which a characteristic of one kind of wave is varied in accordance to another wave or signal as in multiplexors or modems. This equipment transforms computer signals into waves that are compatible with other communications equipment. Examples: AM (amplitude modulation), FM (frequency modulation), PCM (pulse code modulation).

Multiplex — To interleave or simultaneously transmit two or more messages on a single channel. It is the use of a common physical channel in order to make two or more logical channels or by separating them by time, accomplished by several methods such as TDM, STDM, or FDM.

Multiplexed channel — A communication line equipped with mulitplexors at each end. Also called a multiplexor link.

Multipoint — Network configuration in which several stations are interconnected.

Mux — Common term for multiplexor. The equipment that interleaves two or more data streams on to a single transmission path (See TDM).

N

Network — A series of points, nodes, computers, terminals, and communications facilities connected by communications channels.

NMS — Network management system or network management software system, used to configure, control, and monitor networks and connected devices, usually from a single location.

Node — A point where one or more functional units interconnect transmission lines . A physical device that allows for the transmission of data within a network. Typically includes host processors, communications controllers, cluster controllers, and terminals.

O

OCC — Other Common Carrier or a company that provides long-distance services other than AT&T.

OPX—Off-Premises Extensions

P

Packet — A group of data with individual address and control signals in a specified format transferred as a whole within the data network.

Pad — A resistance network assigned the value needed to provide the necessary loss to meet a required transmission level.

PAD (Packet Assembler/Disassembler) — A network interface device that allows multiple asynchronous and/or synchronous terminals or host-computer ports to interface to an packet-switching network. A protocol-conversion device that allows user terminals not equipped for packet switching to communicate over an X.25-based channel.

Parity checking — Parity may be even, odd, or none. This is a method of error checking: the receiving and sending T1 device decides to send with either even or odd (or no) parity. For example, ineven parity, every byte will have an even number of "1's" in it. The parity bit is added or not added to every byte to make sure the addition is always the same. The receiving T1 device can then look at the parity bit along with the rest of the byte, count the number of "1's," and detect an error if that number is not even. It is not a foolproof method of detection, but it is better than no method at all.

PABX (Private Automatic Branch Exchange) — Equipment used for switching telephone calls within a business and from the site to outside lines. It is also used for low-speed transmission of data in addition to voice.

PBX (Private Branch Exchange) — A user-owned telephone exchange.

PCM (Pulse Code Modification) — A common way of converting an analog signal, such as from a telephone conversation, to a digital signal. The modulating signal is sampled and coded so that each element of the information consists of different kinds and numbers of spaces and pulses. PCM samples the voice 8000 times a second and measures each sample in 8 bits. Thus, it encodes one second of voice conversation into 64,000 bits (8 x 8000).

PDN—Public Data Network.

Pipe — A physical T1 communications facility.

Point-to-Point —Connecting two (and only two) nodes without passing through an intermediate node.

POP (Point of Presence) — The point within a local telephone company where the local telephone company terminates subscriber's circuits for leased-line or long-distance dialup circuits.

Port — A point of access into a computer, network, or other electronic device. The entrance or physical access point to a computer, multiplexer, device, or network where signals may be extracted, supplied, or observed. Common ports are the serial and parallel ports on the back of most PCs.

PROM—Programmable Read-Only Memory.

Propagation delay — The time necessary for a signal to travel from one point on a circuit to another.

Protocol — A set of rules for communicating between computers to make sense of the stream of incoming bits. These hardware and software rules govern timing, format, sequencing, and error control. The key elements of protocol are syntax, timing, and semantics. Timing works with speed matching so a computer with a 9600 bps port can talk to one with a 1200 bps port, and it makes proper sequence of data if it arrives out of order. Syntax specifies the signal levels to be used and the format in which the data is to be sent. Semantics includes the information you need for coordinating among machines and for data handling.

Public network — Generally, a network operated by common carriers or telecommunications administrations for the provision of circuit-switched, packet-switched, and leased line circuits to the public. (See Cloud.)

Punchdown — A tool used to cut down through the insulation and get a wire attached to the block.

R

RBPV—Receive Bi-polar violation

Redundancy — 1) The part of the system that duplicates the essential tasks to take over in case the original fails. 2) A communications facility in which there is a spare back-up device for each important component of the system. 3) The part of a message or system that you can discard without losing the esssential information or service.

Remote node — A piece of telecommunications equipment connected to a central hub or a central office.

RI (Ring Indicator) — A modem interface signal defined in RS-232 that indicates to the attached DTE that an incoming call is present. The call is answered when the terminal turns on DTR.

RJ-11 — The standard telephone company 4-wire or 6-wire connector for telephone and telecommuncation equipment (handsets and datasets). Also modular connector.

RJ-45 — An eight-contact connector, often found on the 4-wire E&M card and others.

RMA — Return Material Authorization number

Root rate — 56N or 64N x the number of time slots.

RPA (Rear Plug Assembly) — A rear card for the channel bank.

RS-232C — A technical specification published by the EIA that specifies the mechanical and electrical characteristics of the interface for connecting DTE and DCE. It defines interface circuit functions and their corresponding connector pin assignments. The traditional RS-232 plug has 25 pins. The standard applies to both synchronous and asynchronous binary data transmission.

RTS —Request To Send

RU — Rack unit with standard size of 1 3/4" per RU. This rack spacing is the space between two screw holes.

Rx — Receiving.

RxD—Receive Data

S

Serial RS-232 data link — Conforms to industry standards as listed from AT&T publication RS-232. Serial transmission that sends one bit at a time on a channel.

SDN—Software Defined Network

SINA—Static Integrated Network Access

SDM—Subrate Data Multiplexing

SDM/SRDM—SubRate Digital Mux

S/N ratio (Signal-to-Noise ratio) — The relative power levels of a signal and noise on a communication line, expressed in decibels.

STDM (Statistical Time Division Multiplexor) — An intelligent time-division multiplexer that uses microprocessors and a memory to multiplex data only from active channels. Also called a stat mux or a statisical multiplexor.

Superframe — A D4 frame standard or pattern that identifies a 12-frame sequence. This allows the terminal equipment to rob bit 8 in frames 1 and 6 of voice channels to transmit telephone signaling information.

Synchronous (sync) transmission — A transmission that uses a constant time between successive bits, characters, or events. This is achieved by the sharing of a single clock. Each end of the transmission synchronizes itself with the use of clocks and information sent along with the transmitted data and both ends operate continously at the same frequency.

T

T1 carrier — A digital transmission system developed by AT&T which sends information at 1.544 Mbps, allowing you to simultaneously transmit 24 voice conversations, each encoded at 64,000 bits per second. Many PBXs can connect directly to T1 lines.

TDM (Time Division Multiplexing) — A method of using channel capacity efficiently in which each node is allotted a small time interval, in turns, during which it may transmit a message or a portion of a message. The messages of many nodes are interleaved for transmission and then demultiplexed into their proper order at the receiving end. In TDM, users of a single channel take turns transmitting over the channel with digital signals.

Telco (Telephone Company) — A generic term for the "Telephone Company" and its equipment and networks. Also the Telephone Central Office.

Telecommunications — Any transmission or reception of signals, signs, writing, images, and sounds; or intelligence of any nature by wire, radio, visual, or other electronic media.

Terminal — A workstation designed to send or receive data that allows access to the main computer, multiplexor, or communications device. It is a point in the network at which data can either enter or leave. Examples are personal computers, modems, telephones, and dumb terminals. The terminal usually comprises the following functional units: control logic, buffer store, and input or output device/s, or computer/s.

Throughput — The speed at which work performed by a computer or data is passed through a network. The total measure of useful information processed or communicated during a specific time period. Expressed in bits per second or packets per second.

Tie line — Leased or private dedicated telephone circuit provided by common carriers that links two points together without using the switched telephone network.

Tip and Ring — Two conductors of a cable pair used to carry audio and signaling information between the central office and a subscriber.

TLP—Transmission Level Point

TPA (Transmission Program Alarm) **—** A carrier group alarm.

Timing plan — The plan implemented has the timing selection for all nodes in a network of multiplexers.

Trunk — The facility between customer premise and LEC central office and between carrier central offices.

TS1, TS2 —A type of connectorization to the T1 Channel Bank utility shelf.

TxD—Transmit Data.

V

V.35 — Data-transmission specifications for a wideband modem used widely in North America at the 100-kHz bandwidth. It has options for the transmisson of voice pulse-code modulation signals through the single-sideband amplitude- modulation technique. V.35 operates at full duplex with a 4800-bps line speed, leased lines, and scrambler.

VCO —Voltage Control Oscillator.

X

X.21 — CCITT designation assigned to data transmission over public data networks to interface between DTEs and DCEs for synchronous operation.

X.25 — The protocol interface between user DTEs and packet-switching DCEs.

X.25 pad — A device that permits communication between non-X.25 devices and the devices in an X.25 network.

Appendix B: Site Survey

This site survey is the first step in the installation of a T1 Channel Bank. The site survey contains detailed questions regarding your installation. Completing this survey will make the installation much easier and more efficient.

Site Survey

Name of Organization _____

Completed by _____

Date _____

To install the T1 Channel Bank,you need the following information:

- A system diagram or drawing of the network
- A written description of the application
- A description of the rack or cabinet to house the equipment
- Power locations and amount of current available
- Grounding point near the equipment installation
- Cabling information, who supplies what
- Space available around the equipment
- Environment, air conditioning or ambient temperature
- Carrier or private network
- Type of line coding and framing

System Diagram

Include a detailed diagram of the proposed network. Show the following:

- All nodes
- Type of chassis at each node (expansion, split midplane)
- Kind and number of channel cards in each chassis
- Equipment to be connected to channels (CPU, telephone, PBX)
- Speed of each channel (V.35 @ 38.4 Kbps)
- Number of channels on each T1 trunk
- Type of CSU (internal or external)

Please include any information on the network diagram that may be helpful.

Application Description

Sketch your application here.

Describe your application on the previous page. Include any information that may be helpful. Please answer the following questions in your description:

- Briefly, how will your organization use the channel bank? (for example: OPX's, voice only, for LAN bridge traffic)
- How many channels do you need at each site?
- What type of equipment will be connected to the channel cards?
- How will you use the MCC at this site?
- How many configurations are required (day and night)?
- What if the site uses two T1s to the carrier. Will you set up priority channels?
- Will you use redundant power or redundant T1 logic?
- Is the power requirement AC or DC?
- What type of PBX, if any, is being used?
- Will the connections be to a punch down board, or will they be direct?
- What will the levels at each channel be? (0,0 or +7,-16?)

Rack Mount or Cabinet Description

The T1 Channel Bank can be mounted in a front support rack or center gravity rack. The ears on the chassis can be moved. Other considerations—

- If the T1 Channel Bank is to be placed in a cabinet, the depth required is at least 30 inches.
- If the utility shelf is used for redundant power, it can be mounted above or below the 14-slot chassis.
- If you use an expansion chassis, be sure to use the UL® straps provided.
- The UL® chassis is only required on the bottom of the lineup whether it is in a rack or a cabinet.

NOTE

The T1 Channel Bank is made for a 19-inch rack or cabinet. 23-inch racks or cabinets need special brackets supplied by the factory.

To provide a specific mounting description, complete the form on the following page.

Rack Mount or Cabinet Description

Put a check mark to the left of each item which describes your mounting plan—

Cabinet height

Cabinet width

___ 19"___ 24"

Side panels

___ Right side___ Left side

Top panel

___ Solid___ Louvered___ Modified for fan___ Modified for cables

Optional equipment

___ Plexiglas® door___ Casters___ Perforated shelf___ Additional power strips _____ Additional mounting channels _____ Additional cable guides _____

Blowers

___ Top mounted___ Bottom mounted

Additional notes:

_____

_____

Cabling

Include complete information for all customer-supplied cables to be attached to the T1 Channel Bank chassis.

Show pinouts and cable lengths.

For crossover cables, draw the end-to-end connections; indicate which end is to be attached to the T1 Channel Bank.

Include punchdown block cable pair terminations where required.

Customer-supplied Cable Pinouts and Diagrams

Floor Plan

Include floor plans of all locations at which T1 Channel Bank chassis are to be installed. Show the equipment layout and indicate cable runs. Include site addresses, phone numbers, and contact personnel for each location. Use another sheet of paper if necessary.

Example Floor Plan

SITE _____

CUSTOMER NAME _____

CONTACT PERSON _____

ADDRESS _____

CITY _____ STATE _____

PHONE (____)_____

Site Checkout Form

Please complete this form per site.

1. What is the line code for this site? (AMI, B7, B8ZS) _____
2. What type of framing is used at this site? (D4/SF, ESF)_____
3. CSU for T1s are (internal, external) _____
4. If external CSUs, who is the manufacturer? _____
5. Type of PBX. _____
6. Levels expected at PBX, loss through PBX.

   TX _____

   RX _____
7. Are there sufficient 115VAC power outlets at this site for all the equipment?

   Yes _____ No _____

- 14 slot chassis—1 required

8. Is the breaker rated for the equipment?

   Yes _____ No _____

9. Is a UPS system used with these AC outlets?

Yes _____ No _____

10. Is a good ground available, same as PBX?

Yes _____ No _____

11. Is there sufficient space to work around the system?

Yes _____ No _____

12. Is there sufficient air conditioning/ventilation in the room in which the system will reside?

Yes _____ No _____

13. Is the site a reasonably clean environment?

Yes _____ No _____

14. Will you use passwords on the system?

Yes _____ No _____

15. Will you install the MCC at this site?

Yes _____ No _____

16. Will the MCC ports be routed back to another location from here?

Yes _____ No _____

17. Will you use the multi-configuration option?

Yes _____ No _____

18. Have you established a timing chart?

Yes _____ No _____

19. Is this node a drop and insert or an end node?

D/I _____ end _____

20. Will this site have redundant T1s and redundant power?

redundant T1s _____ redundant power _____

21. Are the voice circuits ground start or loop start?

Gnd start _____ loop start _____

22. Are the voice circuits 600 or 900 ohms?

600 _____ 900 _____